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# ***High-School Manual.***

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***October, 1903.***



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**LAWRENCE, KANSAS.**



## *To High-School Authorities in Kansas.*

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THE UNIVERSITY OF KANSAS is very anxious to do all it properly can to assist the high schools of Kansas. In its relations with them it desires to consider the matter of secondary education on its merits, and not entirely or especially from the standpoint of admission to the University. In order to give the most efficient aid to high schools, the University has appointed as High-School Visitor a man of wide experience and proved ability, in whose fairness and sound judgment it has great confidence. He is commended to superintendents and principals as one who has had their own problems to meet in actual experience, and who is at their command for such suggestions and assistance as he or the University can give.

To aid in the work of unification this High-School Manual is published, and it is confidently expected that it will materially aid in advancing the quality of secondary education in Kansas.

FRANK STRONG,  
*Chancellor of the University of Kansas.*



## *Note.*

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THIS manual is published in response to many inquiries concerning the requirements for entrance to the University. Its purpose is, first, to make a clear statement of the work required of accredited schools, with a view of promoting a reasonable articulation between them and the University; second, to submit a course of study which will satisfy these entrance requirements and at the same time meet the demands of local conditions; and lastly, to present some suggestions in the form of outlines which, if necessary, may be used as supplementary to the text-books adopted by the State Commission. Outlines are prepared in English, German, Botany, Physical Geography, and Zoology, and are intended to indicate briefly the character and amount of work required in each subject.

The University desires in every way possible to help strengthen and unify the high-school work of the state, because in so doing it not only serves its own interests but the cause of education everywhere.

All communications in regard to entrance requirements, course of study, or any other subject pertaining to high-school work, should be addressed to W. H. JOHNSON, High-School Visitor, Lawrence, Kan.



## *Credit Units.*

PREPARATORY WORK is defined in terms of the "entrance unit," which represents five recitation periods weekly, of at least forty minutes each, for not less than thirty-five weeks. Half-units will not be accepted except in advanced algebra, solid geometry, and plane trigonometry. All other subjects must be pursued for at least two terms, or thirty-five weeks, in order to receive full credit.

For admission to the School of Arts, a candidate must offer fifteen units, distributed in six different groups, as follows:

### SCHOOL OF ARTS.

GROUPS.	REQUIRED.	OPTIONAL.
English.....	3 units.	Algebra..... $\frac{1}{2}$ unit.
Mathematics—		Solid geometry..... $\frac{1}{2}$ "
Algebra.....	1 "	Latin..... 4 "
Geometry.....	1 "	German..... 3 "
Foreign languages—		French..... 3 "
Latin or German....	3 "	Greek..... 3 "
Physical science.....	1 "	Physical geography..... 1 "
Biological science.....	1 "	Physics..... 1 "
History.....	1 "	Chemistry..... 1 "
	11 units.	Botany..... 1 "
		Zoology..... 1 "
		Greek and Roman hist... 1 "
		American history..... 1 "
		Economics..... 1 "

Of the fifteen entrance units eleven are required, as indicated above, and the remaining four units may be selected from the optional list without restriction. In case a candidate is unable to offer fifteen units a deficiency of not more than three units will be permitted; but such deficiency must not exceed one unit in any one group, and all conditions must be made good by the end of the first year in the University.

For full admission to the School of Engineering, twelve units will be required of the candidate, as follows:

Mathematics.....	3 units.
English.....	3 "
Physics.....	1 "
Chemistry.....	1 "
Free-hand drawing.....	1 "
German or French, or German and French....	3 "

12 units.

In addition to the twelve units thus required, three units must be selected from the optional list indicated under School of Arts.

In case of a deficiency, the same rules apply as in the School of Arts.

Students who present certificates in accordance with the above regulations, showing that they have completed all the required preparatory studies except such amount of work as may be allowed as a deficiency by the several schools, will be admitted without examination.

Candidates for admission who do not present certificates in accordance with the above regulations will be received into the University only on examination.

Blank certificates of admission will be sent to the principals of accredited schools on application to the Registrar. *Every student must present such certificate before he can be registered.*

Credit in advance of entrance requirements will be given for work done in preparatory schools upon examination *only*.

## High-School Course of Study.

IN suggesting a course of study for high schools, the University assumes no authority whatever. This is a problem that must be solved by the superintendent and principal after consideration of all the conditions bearing on the subject. The course here submitted is only suggestive, and will have served its purpose if, by any hints contained therein, the high schools of the state may be enabled to articulate more closely with the University and at the same time serve in the best possible way those students who wish no educational advantages beyond the high school. Many letters have been received by the high-school visitor asking for suggestions of this nature and it is hoped that this course will render some assistance. It will be observed that entrance requirements to either the School of Arts or Engineering are contained in this outline, and so arranged that the number of classes will not be increased unnecessarily. Drawing may be taken at any time most convenient to the pupil and instructor, hence is not indicated on the program. Since only fifteen units are required for full entrance, one year (or two terms) may be used for such one-term studies as psychology, bookkeeping, advanced arithmetic, reviews, etc. It should be remembered also, that candidates offering twelve units will be admitted to either school conditionally; and where the school is small or the teaching force necessarily limited, it is best not to attempt all the required work. Students thoroughly prepared in twelve units of required work are more desirable than those who have covered all the ground in a superficial way.

### Four-year Course of Study.

#### FIRST YEAR.

##### *First Term :*

Latin or Physiography.  
Algebra.  
Greek History.  
English.

##### *Second Term :*

Latin or Physiography.  
Algebra.  
Roman History.  
English.

#### SECOND YEAR.

Latin or German.  
Algebra.  
Botany.  
English.

Latin or German.  
Geometry.  
Botany.  
English.

## THIRD YEAR.

*(Select four.)*

Latin.	Latin.
Geometry.	Solid Geometry.
Chemistry.	Chemistry.
English.	English.
German.	German.
Mediaeval and Modern History.	Mediaeval and Modern History.
English History.	English History.

## FOURTH YEAR.

*(Select four.)*

Latin.	Latin.
Physics.	Physics.
German.	German.
American History and Civics.	American History and Civics.
English.	English.
Trigonometry.	_____
French.	French.

**Botany. One unit.**

A year's first course in botany in the high schools should be a study of the most fundamental facts of anatomy, morphology, physiology and ecology of the higher plants, and a brief study of the life-histories of some types from the main groups of plants.

The following outline of study is adapted to the time and equipment of high schools: For detailed directions for carrying out such a course read Stevens's *Introduction to Botany*, D. C. Heath & Co., Boston; for inspiration and many useful suggestions, read Ganong's *The Teaching Botanist*, The Macmillan Company, New York; for concise and clear presentation of the main facts of morphology and physiology read Barnes's *Plant Life*, Henry Holt & Co., New York; for an interesting and comparatively full account of vegetable physiology read Green's *Vegetable Physiology*, J. & A. Churchill, London; for practical directions for physiological experiments read Ganong's *A Practical Course in Plant Physiology*, Henry Holt & Co., New York. Have at hand for reference and accessible to the students Mueller's *Fertilization of Flowers*, The Macmillan Company, New York, and Kerner and Oliver's *Natural History of Plants*, Henry Holt & Co., New York.

## OUTLINE.

**SEEDS AND SEEDLINGS.** Three types; a dicotyledon with and without endosperm, represented by Lima bean and castor-bean, and a monocotyledon, represented by Indian corn. Study and draw the

parts in each and the same parts in different stages of germination. Point out the homologous parts in the different types. Study the physiological processes connected with germination, and the external conditions influencing them.

**ROOTS.** The primary and secondary roots of seedlings and the gross anatomy of an older root in a mature plant. The growth in length. The nature, position and use of root-hairs. The nature of soil; the relation of roots to the soil, and what they get from it. The different kinds of roots.

**BUDS AND STEMS.** The anatomy of three types of buds in their winter condition, such as those of the horse-chestnut or hickory, cottonwood, and lilac. The process of unfolding of at least one of these. The morphology of the bud scales. The external appearance of a stem in its winter condition, showing leaf-scars, scars of previous years' bud scales, buds, and lenticels. Angular divergence of the leaves on the stem. The annual increase in length. A short study of the minute anatomy of the stem, showing the distribution and character of its leading tissues. The function of conduction and of strength-giving. The annual increment in diameter. Stems for different purposes.

**LEAVES.** The forms of leaves and their positions with reference to light. The minute anatomy of a typical leaf; the stomata and their mode of action; the epidermis and its use; the palisade and spongy parenchyma; the chloroplasts and the function of photosynthesis; the constitution and distribution of the veins; respiration; transpiration.

**GROWTH AND MOVEMENT.** The nature of growth and its localization in the higher plants. The cell as a living organism and the functions of its different parts. Cell division and enlargement. External conditions affecting growth. The different kinds of movements and their causes. The source of internal energy.

**MODIFIED PARTS.** The elemental characteristics of roots, stems, and leaves, and the evidence to follow in recognizing these morphological elements. Roots modified for special purposes; stems modified for special purposes; leaves modified for special purposes.

**FLOWERS.** Study first some simple flowers, such as of the liliaceous, cruciferous and anemone types, and learn the nature and functions of the different floral parts. Study next selected flowers showing special devices for protecting the pollen and nectar and for insuring pollination, and particularly cross-pollination. Pay particular attention to the relation of insects to flowers, referring to Mueller's *Fertilization of Flowers* and Kerner and Oliver's *Natural*

**History of Plants.** Study several species of a single genus (*Viola*, for example), and several genera of a single family (Liliaceæ or Ranunculaceæ, for example), and several closely related families (Liliaceæ, Iridaceæ, and Amaryllidaceæ, for example), to get a right notion of the grounds on which plants are classified.

**FRUITS AND SEEDS.** Follow the development of the fruits of some of the flowers already studied. Study various sorts of fruits and seeds having special devices to aid in dissemination.

**TYPES OF PLANT GROUPS BELOW THE PHANEROGAMS.** The students should have facilities to examine types with a compound microscope, and this study should be supplemented by reading a good illustrated text. Study bacteria and yeasts; fungi, such as *Mucor*, *Puccinia*, and *Agaricus*; algæ, such as *Pleurococcus*, *Spirogyra*, *Vaucheria*, *Fucus*; Bryophytes, such as some of the common mosses; Pteridophytes, such as some common ferns, a horsetail, and a lycopod. Preserved material may be used where the fresh is not available.

**THE RELATION OF PLANTS TO ENVIRONMENT.** Hydrophytes, mesophytes, xerophytes, halophytes. The distribution of plants according to latitude, altitude, and rainfall.

Throughout this work about three-fifths of the time should be devoted to laboratory work and two fifths to recitations and discussions. The teacher is justified in requiring the students to put in laboratory time beyond that allotted by the regular school curriculum, since in this course less time is devoted to studying lessons at home than is usually the case. For providing the necessary laboratory equipment, and directions for using lenses, etc., read Stevens's *Introduction to Botany*.

### **Zoology. One unit.**

The work in zoology should be undertaken with two distinct objects in view: (1) To afford a thorough training in original observation and the means of recording observed facts, and (2) to present a general view of the animal kingdom and the laws governing its phenomena.

Emphasis should be laid upon training the observational faculties. Facts may be forgotten, but correct habits of work once established will remain with their possessor. Laboratory work must, accordingly, occupy the larger portion of time devoted to zoology. Good representative specimens should be put into the hands of the students and careful drawings and notes required. It has been found best to utilize the first specimen as an object for technical training in ob-

servation, measurement, and drawing, passing more quickly over the other types. The work of the year largely depends upon the habits acquired during the first month.

The style of drawing preferably used is that known as orthographic projection, by which the object is represented in outline as it would appear in silhouette with parallel rays of light. For the proper representation of complicated internal structure, it is advisable to make use of colored crayons by which distinctive colors may be given to different systems of organs.

In selecting materials for class use the endeavor should be made to present as representative a series of types as possible. Marine specimens may be secured at slight expense from the Marine Biological Laboratory, Woods Hole, Mass. It is best, however, to devote the greater portion of time to indigenous forms, since they can be obtained in large numbers and in the living condition. In Kansas the Arthropoda, Mollusca and Vertebrata offer the largest choice. Insects can be utilized very profitably as material for beginning the work and for exemplifying the principles of classification. For this purpose the Orthoptera are particularly available. Field-work and the study of life-histories should not be neglected, but care should be taken lest too much time be devoted to this phase of the work.

The work as pursued in the University concerns itself, first, with a comparative study of the grasshopper and crayfish, both the external and internal anatomy being considered. When the distinctions between the representatives of these two large classes of Arthropods become familiar, comparisons are made between the orders of these classes. To illustrate the structural details upon which minor classifications are founded, representative families in the order Orthoptera are presented, and in the family Acrididæ generic and specific characters are exemplified. From this point onward the work proceeds more rapidly. The other classes of Arthropoda being first disposed of, the work passes on to the Mollusca, the fresh-water clam serving as a type. In order, then, are taken up the Echinoderms, represented by the starfish; the Annulates, by the earthworm; the Coelenterates, by the hydra; Vertebrates, by the dogfish, lizard, or frog. Aside from these types which are studied in detail, many specimens may be examined by the students in order that they may point out the features by which the animals are classified.

The line of study to be followed for each form is indicated by the following analysis:

1. External anatomy: (a) General form and symmetry, regions, parts. (b) Comparison with other individuals of the same species, emphasizing points of variation and constancy. (c) Comparison with other types.

2. Observations on the living animal; simple physiological tests, emphasizing care with regard to the inferences drawn from the reactions.

3. Class topics, including talks by the teacher, selected readings, analysis, with results, etc.

The text-book should be used in connection with the laboratory work. At stated times the recitation should take the form of a lecture and general discussion of such topics as the following: (*a*) Forms and functions of cells. (*b*) Structure and behavior of protoplasm. (*c*) Development and differentiation of the embryo. (*d*) Theory of evolution. (*e*) Nature of specific characters. (*f*) Geographical distribution, etc. (*g*) Color; mimicry; protective resemblance; food and habits.

It is suggested that, in the absence of such illustrative material in the high-school laboratory, more specimens of the local fauna be given detailed treatment. For such use the following list of forms, in addition to those already mentioned, are recommended for study:

Arthropoda: Beetle, butterfly (including metamorphosis); dragon-fly, cicada, squash-bug, bumblebee, sow-bug.

Mollusca: Snail or squid.

Chordata-vertebrata: Salamander, turtle, snake, pigeon, cat, dog, or rat.

Cœlenterata: Jelly-fish.

Platyhelminthes: Planaria.

Echinodermata: Sea-urchin.

### German. One, two or three units.

*First Unit.*—The elements of grammar (the first twenty-four lessons of Otis's Elementary German Grammar, or part I of Joynes-Meissner), including: (1) Careful drill in pronunciation; (2) familiarity with German script and text; (3) the memorizing of paradigms; (4) the writing, correction, memorizing and reciting after correction of all the English-German exercises in one of these grammars; (5) colloquial exercises daily to illustrate and fix the principles and the vocabulary introduced; (6) the memorizing of 100 lines of good German (popular songs or narrative prose). One-half year.

The reading and translation of about seventy-five pages of simple German (as in Huss, Hewett, Joynes-Meissner, Brandt Readers). This reading should involve the reading aloud of the German, the rendering into good idiomatic English, and question and answer in German upon what is read. Word-for-word translation should not be permitted, save when necessary to show the precise force of an idiom. One-half year.

The above work will require, if properly done, five forty-minute periods weekly for thirty-five weeks. A wise plan is to begin with the grammar and carry this continuously for five or six weeks. Then introduce the reader; at first one lesson a week, and then, after ten or twelve weeks, increasing the number of lessons from the reader until the grammar lessons have been completed and thoroughly reviewed.

Teachers who have the necessary acquaintance with the spoken language and a practical notion of how to guide beginners into the use of the German are advised to do so. But care must be taken not to interfere with the accomplishment of the definite results laid down above, and not to make the German recitation a mere amusement hour. Colloquial methods which do not hold strictly to some such outline as the above usually fail to give the pupil sufficient basis for study outside the recitation, and leave him without a definite and systematic knowledge of the structure of the language.

*Second Unit.*—Additional study of grammar, directed to the details of case government, use of the modal auxiliaries, of the subjunctive, and of word order. (The equivalent of lessons XXV to XXXVII in Otis's Grammar, or of part II in the Kansas edition of Joynes-Meissner.) Practice in writing German from dictation, at least eighteen exercises (one a week for a half-year, to occupy fifteen to twenty minutes each).

For this purpose the teacher should use some simple connected story, such as Zschokke's *Der zerbrochene Krug*, or Hauff's *Der Zwerg Nase*, the latter to be had in paper from Chas. H. Kilborn, Boston. The dictations should be examined promptly, corrected, graded, returned, and rewritten by the pupil, to be read aloud from the manuscript or perhaps memorized.

Reading and translation of 100 pages of connected prose and of Schiller's *Wilhelm Tell*, complete. The 100 pages of prose may be made up from the remainder of Brandt's or Hewett's Reader, the completion of Huss or Joynes-Meissner, together with Zschokke's *Der zerbrochene Krug*, Heyse's *Die Blinden* or *Anfang und Ende*, Storm's *Immensee*, Andersen's *Maerchen*, Grimm's *Maerchen*.

In this second year a good plan is to begin with a hasty review of the forms and rules of grammar, taking perhaps two weeks for it. After that the advanced lessons in grammar may be assigned once a week until finished.

In the reading of *Wilhelm Tell* the aim should be to secure appreciation of the literary beauties of the work and to arouse enthusiasm as well as to increase the pupil's control of the language. At least a hundred good lines should be memorized.

*Third Unit.*—Review of grammar, with drill on the less usual strong verbs and on the idioms of tense and order. Composition work, consisting chiefly of paraphrases of the German used for translation.

Reading of 400 pages of standard German, at least one-half of it prose, with careful translation and critical understanding. (Some portion of what is translated should always be read aloud in German.) Suitable works are: Freytag's *Die Journalisten* and Lessing's *Minna von Barnhelm*; Fouque's *Undine*; Hauff's *Das kalte Herz*; Schiller's *Der dreissigjährige Krieg*; Freytag's *Doktor Luther*; Riehl's *Burg Neideck*; Goethe's *Hermann und Dorothea*.

The review of grammar may be taken with a more thorough work, like Thomas or Whitney, or using the same book as in the first year, with additional and more difficult exercises to illustrate the principles and idioms. For composition Hatfield's *Exercises on Immensee* is recommended. In addition to the prepared work in translation, at least half of one recitation period per week during the second half-year should be given to sight translation. Benedix's comedies: *Der Prozess*, or *Einer muss heiraten*, or one of the short stories mentioned for the second year, would be good material.

In the third year, if not before, the pupil should learn to use a German dictionary. The best for the average student's use, considering the price, is Koehler's.

Every teacher of modern languages is advised to procure the Report of the Committee of Twelve of the American Modern Language Association. It contains more details as to methods and fuller lists of texts for the several years. The report is published by the United States Bureau of Education, and also by Ginn & Co., Boston.

### Physical Geography. One unit.

The following outline includes only the most essential facts and principles of physical geography, which must be studied in the classroom and laboratory:

#### THE EARTH AS A GLOBE.

*Shape of earth:* How proved; probable causes of.

*Size:* How measured.

*Rotation:* How proved; day and night; longitude and time; latitude.

*Revolution:* How proved; rate; path; direction.

*Seasons* and their causes.

*Magnetism:* Compass; variation in.

*Map projection* explained.

THE LAND.

*Distribution.*

Graphic representation of topography.

Changes in land areas and land forms: Effects of (1) elevation and depression, of (2) deposition of sediments, (3) of shore erosion.

Plains:

Plains distinguished from plateaus and mountains.

Kinds of: Classification based on genesis, on topography, on fertility, etc.

Development of plains of different forms.

Distribution of the great plains of the earth.

The coastal plain of the Atlantic and Gulf coasts.

The plains of the eastern interior.

The plains of the western interior.

The effect of climate and rock structure on topography of plains.

Alluvial plains: Their formation and importance.

Relation of life to different forms of plains.

Plateaus:

Relation to plains and to mountains.

Stages in the history of a plateau: Young plateaus, dissected plateaus, old plateaus, broken plateaus.

Effects of climate, rock structure, etc., on topography of plateaus.

Location of the great plateaus.

Life conditions on plateaus.

Mountains:

Classes: Block mountains; folded mountains; domed mountains; massive mountains; mountains of circumdenudation.

Effects of climate, rock structure, etc., on mountain topography.

Life conditions in mountains.

Volcanoes:

Distribution.

Phenomena of eruptions.

History of a volcano.

Influence of volcanoes on topography and life.

Rivers:

Life of a river from birth to old age.

The work of rivers.

The topography of surfaces shaped by river erosion at different stages of valley development.

Revived rivers.

*Rivers—continued:*

Drowned rivers and valleys.

The great drainage basins of the United States.

*Lakes:*

The distribution of lakes, particularly in North America.

The changes which they are undergoing.

Their relation to rivers.

Their effect on climate.

Their relation to life in general.

Salt lakes; their history.

The origin of lake basins.

*Glaciers:*

The nature of glacier ice.

The distribution of glaciers.

The conditions necessary for glaciers.

Types of glaciers.

The work of glaciers.

Glaciated areas compared and contrasted with areas that have not been affected by ice, with especial reference to North America.

THE ATMOSPHERE.

Composition and offices of atmosphere.

Instruments used in study of atmosphere.

*Temperature:*

Source of atmospheric heat, and variations of atmospheric temperatures.

Isothermal charts of the world and of the United States, especially the January, July and annual charts, with special study of (1) isotherms of northern and southern hemispheres; (2) location of heat equator; (3) cold pole; (4), crowded isotherms, etc.

*Pressure:*

Measurement of pressure.

Determination of altitudes by atmospheric pressure.

Relation to temperature.

Study of isobars on United States weather maps.

Distribution of pressure in general, in midwinter, and in midsummer.

Relation of pressure and temperature.

*Circulation of atmosphere:*

Winds: Their causes; their classes; their effects.

*Moisture:*

Sources.

Condition for precipitation.

**Moisture—*continued*:**

Forms of precipitation: Rain and snow; dew and frost; distribution of rain and snow, principles governing.

Relation of precipitation to life.

**Storms:**

Cyclones of temperate and tropical latitudes.

Paths and characters of storms of United States.

Relation of storms to general weather conditions.

Weather at different seasons; study and construction of weather maps.

Relation of weather to climate.

Relation of climate, weather, etc., to life and to human industries.

**THE OCEAN.**

Form, divisions and general characteristics of the oceans, and of ocean basins.

Depth, density and temperature of ocean waters.

Characteristics of ocean floor; topography, material, etc.

The life of the oceans.

**Movement of ocean waters:**

Waves; cause and effect.

Currents; causes and their proofs; important currents; effects of currents on climate, life, etc.

Tides; character of motion; causes of tides; variation of tides, and their causes; bores; effect of tides on navigation, harbors, etc.

**Work of ocean:**

Erosion and deposition.

Shore lines; the leading types, and their distribution.

Influence of harbors and coast lines, now and in the past.

**Summary.**

The outline given can but enumerate the larger topics to be covered, and in a way suggest the point of view desired.

Each topic should be treated so as to show its casual relations to other topics. So far as possible, the effects of earth features on life (especially human life) conditions should be emphasized.

**English. Three units.**

The requirements in English for admission to the University of Kansas, requirements standard for all American colleges, formally comprise only English literature (chiefly classics) and English composition. As originally formulated, these requirements were defined

by stating as follows the nature of the examination to be based upon them :

"I. READING.—A certain number of books will be set for reading (see list subjoined). The candidate will be required to present evidence of general knowledge of the subject-matter, and to answer simple questions on the lives of the authors. The form of examination will usually be the writing of a paragraph or two on each of several topics to be chosen by the candidate from a considerable number—perhaps ten or fifteen—set before him in an examination paper. The treatment of these topics is designed to test the candidate's power of clear and accurate expression, and will call for only a general knowledge of the substance of the books. In place of a part or the whole of this test, the candidate may present an exercise book, properly certified by his instructor, containing compositions or other written work done in connection with the reading of the book. In preparation for this part of the requirement, it is important that the candidate shall have been instructed in the fundamental principles of rhetoric.

"II. STUDY AND PRACTICE.—This part of the examination presupposes the thorough study of each of the works named in this division. The examination will be upon subject-matter, form, and structure. In addition, the candidate will be required to answer questions involving the essentials of English grammar, and on the leading facts of the periods of English literary history to which the prescribed texts belong.

"NOTE.—No candidate will be accepted in English whose work is notably defective in point of spelling, punctuation, idiom, or division into paragraphs."

The list of classics recommended for the examinations occurring in September, 1904, and September, 1905, is as follows:

FOR GENERAL READING AND COMPOSITION WORK.

Shakspere—The Merchant of Venice.

" —Julius Cæsar.

Addison—The Sir Roger de Coverley Papers.

Goldsmith—The Vicar of Wakefield.

Coleridge—The Rime of the Ancient Mariner.

Scott—Ivanhoe.

Carlyle—Essay on Burns.

Tennyson—The Princess.

Lowell—The Vision of Sir Launfal.

Eliot—Silas Marner.

FOR CAREFUL STUDY.

Shakspere—Macbeth.

Milton—Minor poems (Lycidas, Comus, L'Allegro, Il Penseroso).

Burke—Speech on Conciliation with America.

Macaulay—Essay on Milton.

" —Essay on Addison.

For the years 1906, 1907 and 1908 the list is slightly changed by substituting for the Vicar of Wakefield Irving's Life of Goldsmith, for Macaulay's Essay on Milton Macaulay's Life of Johnson, and

for *The Princess* three of Tennyson's *Idylls of the King*, namely, *Launcelot and Elaine*, *The Passing of Arthur*, and *Gareth and Lynette*. To the reading list is added Scott's *Lady of the Lake*, and *Macbeth* and *Julius Cæsar* are interchanged in position.

Since the general adoption of the requirements thus indicated, the following supplementary recommendations have been made:

1. That English be studied throughout the primary and the secondary school courses, and when possible for at least three periods a week during the four years of the high-school course.

2. That the prescribed books be regarded as a basis for such wider courses of English study as the schools may arrange for themselves.

3. That where careful instruction in idiomatic English translation is not given, supplementary work to secure an equivalent training in dictation and in sentence structure be offered throughout the high-school course.

4. That a certain amount of outside reading, chiefly of poetry, fiction, biography, and history be encouraged throughout the entire school course.

5. That definite instruction be given in the choice of words, in the structure of sentences and of paragraphs, and in the simple forms of narration, description, exposition, and argument. Such instruction should begin early in the high-school course.

6. That systematic training in speaking and writing English be given throughout the entire school course. That, in the high school, subjects for compositions be taken partly from the prescribed books and partly from the student's own thought and experience.

7. That each of the books prescribed for study be taught with reference to: (a) The language, including the meaning of words and sentences, the important qualities of style, and the important allusions. (b) The plan of the work, *i. e.*, its structure and method. (c) The place of the work in literary history, the circumstances of its production, and the life of its author. (d) That all details be studied, not as ends in themselves, but as means to the comprehension of the whole.

To these recommendations a paragraph on grammar has since been added:

The student should have a sufficient knowledge of English grammar to enable him at need to point out the syntactical structure of any sentence which he encounters in the prescribed reading. He should also be able to state intelligently the leading grammatical principles when he is called upon to do so. Whether this knowledge is obtained in the elementary school and the secondary school combined, or only in the elementary school, is immaterial, provided the student have it; but in most cases it cannot be acquired except through regular study and practice in the lower grades, and scarce through these. A progressive and regular development of the grammar sense, from the lowest grades to the highest, is much to be preferred to a sudden and unprepared for injection of formal grammar at a particular stage, as, for example, in the eighth grade.

It has further been advised that training in composition should

be oral as well as written, and continuous through the high school; that text-books in rhetoric be used with discretion, and disused on occasion; that the studies of composition and of classics be correlated throughout the high-school course in the proportion of about three recitation periods weekly of classics to two periods of composition; and that the length of the course as recommended be three years.

It is intended that the suggested list of classics shall be varied at pleasure, and that it shall be freely supplemented with other books of similar character and with the collateral outside reading of biography and history. The arrangement of the books and the order of study is left to the teacher and must vary with circumstances. In general, the order of advance may be from more modern to earlier authors, American before English, or from prose to verse, or from narrative and concrete types to reflective and abstract ones; or, since these principles cannot all be applied at once, any combination of them that under existing conditions seems to be the order of increasing interest and of easiest approach to difficulties, and that will at the same time coordinate the study with that of composition. The only class text-books needed, except for reviewing the history of the periods concerned, are editions of the books read in class; and this reading is to be accompanied with such discussion as will best serve to aid students to appreciate the form, style, and spirit of the books read, as well as to understand their subject-matter and their general relations, historical and personal.

If it is assumed that the high-school course is to include only the books named in the preceding list, it is evident at once that it is not easy to arrange them in accordance with the preceding suggestions. The selections assigned for class study comprise no fiction or simple verse, such as is easiest to begin with, and in the entire list American literature is represented by only one short poem. It may, perhaps, be assumed that American fiction and verse will have received some distinctive attention in the grades, and that grade pupils have learned how to read and enjoy and appreciate books at home, and how to think and talk about them; but the fact remains that the list is far too short to afford material representative of either periods or types with anything like the fulness that is desirable, and the advantage of supplementing it is obvious. If this could not be done, it would be expedient, before taking up the classics prescribed for careful study, to spend some time upon a part of the fiction and modern verse in the home-reading list, in order to show such pupils as might need it how the home reading and study may be carried on. To do this will be the more necessary and will take a longer time if the class has lacked good training in the grades. Afterward,

when this preliminary study of fiction and verse has been completed, and the pupil is left to continue his reading of it outside of class, the results of that reading should still be constantly tested by making it as often as necessary the subject of class discussions and of written reports and essays. Although not specifically mentioned in the reading list, the outside reading is always to include biographical and historical matter relating to the authors, the texts, and the periods represented.

Arranged in general accordance with these suggestions, and without additions of any kind, the order of study for the classics in the recommended list might be as below. Books that may be read at approximately the same time are placed in the same horizontal line. The spare time in the right-hand column may be filled with reference reading of biography and literary history.

*In class.*

*Out of class.*

Eliot.—Silas Marner; parts, or general survey and discussion.

Lowell.—Vision of Sir Launfal, entire; rapid reading and general discussion.

Macaulay.—Essay on Addison.

Macaulay.—Essay on Milton.

These studied as examples of Macaulay's style and method; the information given about Milton and Addison of secondary value.

Burke.—Speech on Conciliation; as an example of Burke's style and of his method in argument.

Goldsmith.—Vicar of Wakefield; in part, but enough to enable class to note peculiarities of eighteenth-century style.

Milton.—Minor Poems; compared with verse of nineteenth century.

Shakspeare.—Macbeth; intensive study.

Eliot.—Silas Marner, completed. Scott.—Ivanhoe; while Lowell is under discussion in class.

Tennyson.—The Princess.

Coleridge.—The Ancient Mariner.

These read after Lowell, while Macaulay is under discussion in class.

Carlyle.—Essay on Burns; to follow Macaulay, while Burke is being studied in class.

Goldsmith.—Vicar of Wakefield; completed, and compared with later fiction of Eliot and Scott.

Addison.—Sir Roger de Coverley Papers; compared with nineteenth-century essays while Milton is continued in class.

Shakspeare.—Merchant of Venice. Shakspeare.—Julius Cæsar.

General chronological review.

When the recommended classics are thus tabulated, it is evident that in three years many others besides these can be read, and also that the dividing of the course into one-year units is a matter that

may be governed by circumstances or by the convenience of the teacher. The course should be viewed as a whole and taught as a whole, without other than necessary reference to years and terms. If the indicated order be followed, perhaps the most convenient division would end the work of the first year with Macaulay and Coleridge, that of the second with Milton and Addison, and would give the third year to Shakspeare and the general review.

The preceding arrangement is such that as a rule no classic is read at home until part of it or until a similar one has been studied in class. The purpose of this is to insure a fuller appreciation of the books read at home. That the pupil may in his class study have passed on to another type of literature, does not make any difficulty. When a classic has been assigned for home reading, a recitation period may be spent in the preliminary discussion of it, and essay subjects relating to it may then be assigned; when the home reading of it is completed at least one or two recitation periods may be spent in reviewing it, and some of the essays may then be presented in class. Whenever time presses, a longer classic, the reading of which has been begun in class, may be completed out of class, provided always that the teacher sees to it that, by means of final discussion or otherwise, the work shall be understood as a whole, and that its literary or artistic unity shall be the chief thing to be impressed on the minds of the pupils.

The class study of literature is intended to be much more thorough, and therefore much more critical, than the collateral home reading. It must be systematic, and yet no single system or method can be made to apply to all the books studied. Indeed, it might almost be said that if a method of study proves satisfactory with one book or class, or in the hands of one teacher, that is an excellent reason why it is likely not to be satisfactory with another book or class or teacher. Certain things, however, may be indicated as belonging in general to the critical study of literature; and in taking up the study of a classic the teacher must decide which or how many of them may profitably be applied in that instance, and must be ready to supplement them with others. Such a list of what may be called points of attack upon a classic is as follows:

A.—The meaning of the classic: interpretation and abstract; the clearing up of all difficulties of words or phrases, figures and allusions; the analysis of logical structure, the determining of important events and characters and of the central lesson or purpose of the work as a whole.

B.—The style of the classic; study of selected passages, to note distinctive peculiarities of language or structure and to determine which of them contribute to the merit of the work or throw light upon the personality of the author.

C.—The method of the classic, logical or artistic; after the interpretation is completed, deciding to what type or class of literature it belongs and developing as far as may be some of the principles upon which that classification is based.

D.—Relation of the author to the classic; the study of his purpose and motive and of his reasons for his choice of subject and of form, of his attitude toward his work, his general habit of thought, and so on.

E.—General relations of the classic, historical and literary; after the collateral reference reading is completed, study of the historical basis of the work, its place in literary development, its influence, and so on.

F.—General review and summary of whatever matters have been taken up for special study; selection of best parts and passages, and general estimate of the literary value of the work.

With a beginning class, and with some books of less importance, it might be best to confine attention to topics A and F of this list. With a class a little more advanced, and with suitable books, other topics may be introduced. A new topic of study may receive a greater proportion of time than those earlier considered; and it is necessary to be very careful not to take up too many points in the study of any one book; its central meaning and unity, its distinctive purpose, relations and merit, are among the chief things to be kept in view.

The correlation of the studies of composition and of classics consists not only on carrying them on side by side, but in making use of the books read to illustrate principles of expression which students may apply in their own speech and writing, in assigning subjects which will require independent critical reading of books in hand, or reading for information on special topics, and, so far as is convenient, in keeping to the same general order of subjects in both studies, so that the work done in each may reenforce that of the other. Abstracts and summaries of books read should never be required as composition exercises except when absolutely necessary, as they hinder the growth of that independence of view which is essential in the critical study of literature. To maintain and develop ease and originality of expression, fully half of the composition exercises should be based on the student's experience; that is, on his present or past observation; and on occasion exercises may be partly or wholly imaginative.

Composition and rhetoric are not to be regarded as distinct subjects in the high-school course. A rhetoric is merely a text-book in composition, and in the study of composition, as in that of literature, the use of formal text-books is purely an incidental matter. The principal part of the work must always be the preparation and discussion of oral and written exercises. Such an exercise of some kind, longer or shorter, should be a part of every lesson, and probably

at least one exercise every week should be a written exercise of some length.

Points that may be successively considered in a course in composition are the structure of discourses, of paragraphs, and of sentences, the choice and use of words, and the nature and more general principles of narration and description, exposition and argument; and throughout the course a most important object to be kept in view is the securing of easy and spontaneous expression, and the adaptation of material to the person or public addressed. To accomplish this most successfully, the work may well begin with the preparation of stories; that is, of narrative or descriptive exercises, based on observation or on imagination. Then may follow the preparation of essays presenting reflective material derived from all sources, and the study of theme, plan, and paragraphs. Then, with any sort of material or treatment, may be taken up the study of sentences and words and the general principles of style; and, finally, the general principles of all forms of discourse, and, in particular, of narrative and exposition, may be considered, with appropriate material and exercises. Any text-book may be used, in so far as it is suitable and helpful; but no text-book should be followed too closely, and no topic or exercise assigned for no better reason than that it is to be found in the book.

*Under no circumstances should a period be spent in memoriter recitation upon any text; if there can be no practical illustrative exercise of any kind the study of rhetorical theory is of little worth, except for such incidental aid as it may furnish toward the appreciation of literature, and this is too little for the time expended. Often the work in composition may be done most successfully without the use of any text or texts whatever, except for reference and in reviewing.*

Any division according to years or terms of the subjects named must be discretionary, to suit the conditions of individual schools or of individual classes and teachers. The following general outline suggests a purely tentative arrangement by years, which may, perhaps, sometimes be followed when no better plan can be devised. It includes classics as well as composition, in the order already specified.

FIRST YEAR.

IN CLASS.

OUT OF CLASS.

*Literature.* Three periods weekly.  
 Silas Marner, in part.  
 Vision of Sir Launfal.  
 Essay on Addison.  
 Essay on Milton.  
 Other books as selected.

Silas Marner, completed.  
 Ivanhoe.  
 The Princess.  
 The Ancient Mariner.  
 Essay on Burns.  
 Reference reading of biography, history, etc.

*Composition and Rhetoric.* Two periods weekly.

The finding, shaping and adapting of material, in written and oral exercises; stories, letters, essays, study of theme, plan, and paragraph.

SECOND YEAR.

IN CLASS.

OUT OF CLASS.

*Literature.* Three periods.  
 Speech on Conciliation.  
 Vicar of Wakefield, in part.  
 Minor Poems of Milton.  
 Other books as selected.

Vicar of Wakefield, completed.  
 Sir Roger de Coverley Papers.  
 Reference reading.

*Composition and Rhetoric.* Two periods.

The principles of style, in written and oral exercises; stories, letters, essays, study of sentence structure and of choice and use of words, study of paragraphs, translation, synonyms, figures, verse forms, etc.

THIRD YEAR.

IN CLASS.

OUT OF CLASS.

*Literature.* Three periods.  
 Macbeth.  
 Other books as selected.  
 General historical review.

Merchant of Venice.  
 Julius Cæsar.  
 Reference reading.

*Composition and Rhetoric.* Two periods.

The forms of discourse; stories, letters, essays, study of nature and principles of narration and description, exposition and argument.

To secure the continuous study of English through the four years of a high school either of two methods may be followed. If practicable, it is of advantage for all students, and particularly for such as do not afterward enter college, to add a fourth year of English to the three full years herein described as a college-entrance require-

ment. If this is not practicable, the three years' work may be distributed through four years by assigning to it fewer than five recitation periods a week in the last two years, so that the total time given it is not increased.

At the present time the number of excellent text- and reference books in English subjects is so great that it is scarcely practicable to specify any one as being the best of its class. Editions of the classics named herein for high-school use may be had of any educational publisher. Among the good text-books in composition and rhetoric are those of Genung, Newcomer, Webster, Mead and Gordy, Scott and Denney, Lockwood and Emerson, Smith and Thomas, Herrick and Damon (revised edition), Gardiner, Kittredge, and Arnold, Kavanagh and Beatty; and several others are now in press or announced for immediate publication. A convenient little reference book on methods of teaching classics is Heydrick's *How to Study Literature*; and the most recent and most complete treatise yet published on methods of teaching English subjects in general is Carpenter, Baker, and Scott's *The Teaching of English*.

The University department of English has prepared a *Handbook on the Teaching of English*, with especial reference to the University requirements and to the educational conditions of the state. Its special purpose is to discuss in detail principles and methods of teaching English composition, English literature and English language in secondary schools, and to show the relation of high-school English teaching to the English work of other schools below and above. It outlines fuller courses in English than that herein described, and includes an extended classified and descriptive list of text- and reference books in every department of English, with their publishers, dates, and prices. The work is completed, and is now awaiting state publication, in order that it may be sent to any English teacher on application.\*

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\* The department has also recently prepared a theme and essay tablet for use in composition teaching with any text-book, or without a text-book. It is published by O. P. Barnes, 378-388 Wabash avenue, Chicago, Ill., price, 15 cents.









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BULLETIN  
OF THE  
UNIVERSITY OF KANSAS.

# HIGH-SCHOOL MANUAL.



SEPTEMBER 1904.

UNIVERSITY OF ILLINOIS

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LAWRENCE, KANSAS



**The University of Kansas,  
Lawrence.**

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**High-School Manual,**  
**No. II.**

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**October, 1904.**



**LAWRENCE, KANSAS.**



## Purpose.

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THE University, in order to contribute its part towards securing greater efficiency in preparatory work, authorizes the publication of a second number of the High-School Manual. The greater portion of its contents is devoted to a statement of the character and amount of work in each branch which is required for a unit of credit. We have learned by visitation and by correspondence that these facts are not always clear to teachers in the high schools, and have taken this method to explain the meaning of these requirements.

It is unnecessary to make special mention of the subjects outlined, only to suggest that all were prepared by the professors at the heads of the departments represented, who aimed in each case to prescribe a course that would not exceed the capacity of the average high-school student, and at the same time qualify him for the more serious tasks of college work. What the University then desires to realize from a closer relationship with the high schools of the state is a high degree of efficiency in all lines of secondary work. Such a condition can only be brought about by cooperation of endeavor and a mutual understanding and agreement between the departments of secondary and higher education. The University invites correspondence in the way of suggestion or criticism from those who have problems to solve, or whose experience would be of value to the best interests of all concerned.

## Requirements for Admission.

The requirements for entrance to the University remain substantially the same as last year, the only change being the addition of a unit credit for a year of medieval and modern history.

The subjects from which entrance work may be offered, together with the number of units, are arranged in six groups, as follows; a total of fifteen units must be offered:

GROUP I, English.	{ English, four units.	{ Three units are required.
GROUP II, Mathematics.	{ Algebra, one and one-half units. Plane geometry, one unit. Solid geometry, one-half unit. Plane trigonometry, one-half unit.	{ The algebra, one and one-half units, and plane geometry, one unit, are required.
GROUP III, Foreign Languages.	{ Latin, four units. Greek, three units. German, three units. French, three units.	{ Of these, three units are required, which must be, first, in Latin, or, second, in German, if German has been approved by the high-school visitor.
GROUP IV, Physical Sciences.	{ Physical geography, one unit. Physics, one unit. Chemistry, one unit.	{ One unit is required.
GROUP V, Biological Sciences.	{ Botany, one unit. Zoölogy, one unit.	{ One unit is required.
GROUP VI, History.	{ Greek and Roman, one unit. Medieval and modern, one unit. English, one unit. American, one unit. Economics, one unit.	{ One unit is required.

As observed above, to secure unconditional admission to the Freshman class of the College the candidate must offer fifteen units from the foregoing list of accredited preparatory subjects. Of these fifteen units, eleven and one-half are prescribed by group; the re-

maining units may be any in the list. The eleven and one-half prescribed units must include three units of English, two and one-half units of mathematics, three units of language, and one unit each from the groups of physical science, biological science, and history.

In view of the difficulty some preparatory schools may have in expanding their courses of study so as to include all the prescribed units, until further notice candidates will be admitted unconditionally who offer fifteen units from the foregoing list, although some of the prescribed units may not have been completed. Such postponement of the completion of preparatory requirements is possible only in those subjects in which elementary courses are offered in the College. They include all the subjects in the list of preparatory studies except three units of English, two units of Latin, two and one-half units of mathematics, physical geography, and American history.

Students who take advantage of this privilege of postponing prescribed entrance requirements must make good such deferred requirements during their first year in the College. A course so taken during the Freshman year not only satisfies the entrance requirements, but also counts as regular College work.

It is hoped that within a reasonable time all Kansas high schools will be able so to arrange their courses of study as to meet all the entrance requirements of the University.

Candidates who have wholly or partially completed their preparation in accordance with the system of entrance requirements previously in operation will be given due credit, as if no change in requirements had been made.

# High-School Course of Study.

## First Year.

### FIRST SEMESTER.

#### Required:

English.

Algebra.

#### Electives (choose two):

Latin.

Physiography.

Arithmetic.

### SECOND SEMESTER.

#### Required:

English.

Algebra.

#### Electives (choose two):

Latin.

Physiography.

Physiology.

## Second Year.

### FIRST SEMESTER.

#### Required:

English.

Algebra.

#### Electives (choose two):

Latin.

German.

Botany.

Greek and Roman History.

### SECOND SEMESTER.

#### Required:

English.

Geometry.

#### Electives (choose two):

Latin.

German.

Botany.

Greek and Roman History.

## Third Year.

### FIRST SEMESTER.

#### Required:

English.

Geometry.

#### Electives (choose two):

Latin.

German.

Chemistry (or Physics in three-year course).

Medieval and Modern History (or American History in three-year course).

Zoology.

English History.

### SECOND SEMESTER.

#### Required:

English.

Geometry.

#### Electives (choose two):

Latin.

German.

Chemistry (or Physics in three-year course).

Medieval and Modern History (or American History in three-year course).

Zoology.

English History.

## Fourth Year.

### FIRST SEMESTER.

#### Electives (choose four):

English.

Physics.

Latin.

German.

American History.

Trigonometry.

Economics.

### SECOND SEMESTER.

#### Electives (choose four):

English.

Physics.

Latin.

German.

American History.

Bookkeeping.

Economics.

## Accredited Preparatory Schools for 1904-'05.

Schools printed in *italics* offer courses of study which meet all the requirements for admission to the Freshman class of the College.

Schools not printed in *italics* fall short of full preparation by not more than three units.

<i>Name of high school.</i>	<i>Superintendent.</i>	<i>Principal.</i>
<i>Abilene</i> .....	W. B. Hall.....	B. C. Biggart, A. B.
<i>Albuquerque, N. M.</i> .....	A. B. Stroup .....	J. A. Miller.
<i>Anthony</i> .....	J. H. Clement, A. B. ....	Clara Gilmer.
<i>Argentine</i> .....	H. P. Butcher.....	Frank Agrelus.
<i>Arkansas City</i> .....	L. W. Mayberry, A. B. ....	Helen Moffet, A. B.
<i>Atchison</i> .....	Nathan T. Veatch.....	A. H. Speer, A. B.
<i>Atchison Co., Effingham.</i>		John W. Wilson, A. B.
<i>Augusta</i> .....	Charles W. Pratt .....	
<i>Axtell</i> .....	R. E. Long .....	Avis Stanley.
<i>Beaverhead Co., Dillon, Mont.</i>	J. A. Koontz, A. B.,	Elizabeth W. Hawley.
<i>Belle Plaine</i> .....	H. C. Jent.....	Lulu Grosh, A. B.
<i>Belleville</i> .....	J. C. Wright.....	H. J. Mummau.
<i>Beloit</i> .....	C. A. Shively.....	C. H. Taylor.
<i>Blue Mound</i> .....	A. S. Hiatt, A. B. ....	A. S. Hiatt, A. B.
<i>Blue Rapids</i> .....	William H. Andrews, A. B.	Mrs. Annie Cockerill.
<i>Burlingame</i> .....	W. L. Holtz, A. B. ....	Olive Stewart, A. B.
<i>Burlington</i> .....	W. A. Stacey, B. S. ....	Alice Spalding, A. M.
<i>Burrton</i> .....	Robert N. Halbert, Ph. B.	D. L. Swanstrom, A. B.
<i>Carbondale</i> .....	C. A. Deardorff, M. E. ....	Cora Silvernail, A. B.
<i>Centralia</i> .....	N. F. Daum, A. B. ....	Bertha Roberts.
<i>Chanute</i> .....	W. E. Royster.....	J. A. Cannan.
<i>Chase Co., Cottonwood Falls</i>		B. F. Martin.
<i>Cherryvale</i> .....	A. J. Lovett, A. B. ....	Bennett Grove.
<i>Clay Co., Clay Center</i> ...		S. A. Bardwell.
<i>Clifton</i> .....	G. B. Buikstra, A. B. ....	Mrs. Hart, A. M.
<i>Clyde</i> .....	C. M. Ware.....	
<i>Coffeyville</i> .....	William M. Sinclair .....	Anna Paterson.
<i>Colony</i> .....	John B. White.....	
<i>Concordia</i> .....	A. B. Carney.....	Benjamin Ward, A. B.
<i>Crawford Co., Cherokee.</i>		W. S. Pate.
<i>Decatur Co., Oberlin</i> ...		Harlan Q. Banta, A. M.
<i>Delphos</i> .....	M. S. Shaible, B. S. ....	Henrietta Douthart, A. B.
<i>Dickinson Co., Chapman.</i>		Homer S. Myers, A. M.
<i>Dodge City</i> .....	C. A. Smith .....	Carl Miller.
<i>Downs</i> .....	B. K. Farrar, B. S. ....	Kate Clark, A. B.
<i>El Dorado</i> .....	C. A. Strong.....	J. A. Hall, A. B.
<i>Ellsworth</i> .....	E. T. Fairchild .....	Lila K. McCatter.
<i>El Reno, Okla</i> .....	F. N. Howell, A. B. ....	D. F. Koontz.
<i>Elsmore</i> .....	M. L. Cotton.....	M. L. Cotton, A. B.
<i>Emporia</i> .....	L. A. Lowther, A. B. ....	J. H. Sawtell, A. B.

<i>Name of high school.</i>	<i>Superintendent.</i>	<i>Principal.</i>
<i>Eureka</i> .....	B. E. Lewis, A. M.....	C. E. Carpenter, A. M.
<i>Eureka (Southern Kansas Academy)</i> .....		Geo. C. Snow, A. B.
<i>Everest</i> .....	H. W. Hoffman, A. B.....	H. W. Hoffman, A. B.
<i>Florence</i> .....		C. E. St. John,
<i>Fort Scott</i> .....	D. M. Bowen, A. B.....	W. C. Lansdon, A. B.
<i>Frankfort</i> .....	M. G. Kirkpatrick.....	Harriet Landers.
<i>Fredonia</i> .....	I. L. Garrison, B. S.....	W. I. Mathews.
<i>Galena</i> .....	Leslie T. Huffman.....	L. J. Pickering, B. S.
<i>Garden City</i> .....	A. C. Wheeler.....	Nettie M. Lawrence, A. B.
<i>Garnett</i> .....	C. H. Oman, A. B.....	George Nickols.
<i>Girard</i> .....	H. W. Shideler, A. B.....	Lillian Bell, A. B.
<i>Gove Co., Gove City</i> .....		S. E. Lee.
<i>Great Bend</i> .....	Warren Baker.....	Mrs. Eva G. Clark, A. M.
<i>Gypsum</i> .....	A. R. Manning.....	A. R. Manning.
<i>Halstead</i> .....	C. O. Smith.....	Orrell McCroskey, A. B.
<i>Hays</i> .....	W. H. Keller.....	
<i>Herington</i> .....	W. W. Jones.....	Lavonia M. Donica.
<i>Hiawatha</i> .....	F. M. Hammitt, A. B.....	George Pinney, A. B.
<i>Hiawatha Academy</i> .....		G. A. Hoffman, A. M.
<i>Holton</i> .....	Edwin L. Holton, A. B....	S. A. Norris, A. B.
<i>Horton</i> .....	J. O. Hall, A. B.....	Inez M. Chapman, A. B.
<i>Howard</i> .....	Irwin Stimmel, Ph. B....	H. D. Paynter, A. M.
<i>Humboldt</i> .....	J. E. Cook.....	H. M. Cunningham.
<i>Hutchinson</i> .....	Richard R. Price, A. M....	C. A. Wagner, A. B.
<i>Iola</i> .....	(Miss) Clifford Mitchell..	L. H. Wishard.
<i>Joplin, Mo.</i> .....	W. P. Roberts.....	L. L. Liehlita, A. M.
<i>Junction City</i> .....	W. S. Heusner, A. M.....	Chas. S. Robbins, A. M.
<i>Kansas City, Kan</i> .....	M. E. Pearson, B. D.....	W. C. McCroskey, A. B.
<i>Kan. City, Mo., Central,</i>	J. M. Greenwood, Ph. D...	I. I. Cammack.
“ <i>Man.Tr.</i> .....	“.....	E. D. Phillips, Ph. M.
“ <i>Westport.</i> .....	“.....	S. A. Underwood.
<i>Kingman</i> .....	Alvin W. Ault, A. B.....	Margaret Benedix.
<i>Kinsley</i> .....	D. A. Baugher.....	D. A. Baugher.
<i>Labette Co., Altamont</i> ...		W. M. Kyser, A. B.
<i>La Cygne</i> .....	J. E. Chamberlain.....	Edna Boyd.
<i>Larned</i> .....	W. S. Robb, A. B.....	Agnes Unruh, A. B.
<i>Lawrence</i> .....	F. P. Smith, A. M.....	F. H. Olney, A. B.
<i>Leavenworth</i> .....	George W. Kendrick.....	W. A. Evans.
<i>Le Roy</i> .....	G. E. Brown.....	Mary M. Baird.
<i>Lewis Academy, Wichita</i>		J. M. Naylor, Ph. D.
<i>Lyndon</i> .....	F. W. McCabe, A. B.....	Elizabeth Gernon, A. B.
<i>Mankato</i> .....	F. W. Simmonds, M. S....	Agnes Graham.
<i>Marion</i> .....	H. H. Van Fleet, A. B.....	Clara Morris.
<i>Marysville</i> .....	C. B. Myers, A. B.....	A. J. Clark, A. B.
<i>Medicine Lodge</i> .....	A. B. Honnald, Ph. B.....	
<i>Minneapolis</i> .....	A. F. Senter.....	D. O. Smith.
<i>Moline</i> .....	Charles W. Pennel.....	
<i>Montgomery Co., Independence</i> .....		S. M. Nees, B. S.
<i>Moran</i> .....	Guy M. Tredway.....	Guy M. Tredway.
<i>Mound City</i> .....	C. L. King.....	C. L. King.
<i>McPherson</i> .....	R. M. Killion, A. B.....	Mame A. Curry.
<i>Neodesha</i> .....	John W. Brown.....	J. F. Steffen.
<i>Newton</i> .....	D. F. Shirk.....	Mrs. A. N. Turner.
<i>Norton Co., Norton</i> .....		W. G. Riste.

<i>Name of high school.</i>	<i>Superintendent.</i>	<i>Principal.</i>
Nortonville.....	E. H. McMath, A. B.....	.....
Olathe.....	R. L. Parker, A. M.....	G. M. Husser, Ph. B.
Oklahoma City, Okla....	Ed. S. Vaught, B. S.....	.....
Osage City.....	J. T. Albin, A. M.....	Vincent C. Poor.
Osawatomie.....	.....	Beulah Roberts, A. B.
Osborne.....	C. N. Poe, A. M.....	Nettie Beatty.
Oskaloosa.....	J. H. Gibson.....	Mayme Hamilton.
Ottawa.....	A. L. Bell, Ph. B.....	H. P. Study, A. B.
Paola.....	E. D. George, A. B.....	F. K. Ferguson, B. S.
Parsons.....	J. A. Higdon.....	Louise M. Schaub.
Peabody.....	A. H. Newton.....	Louise Doerle.
Pittsburg.....	A. H. Bushey.....	C. W. Kline, A. B.
Pleasanton.....	John Groendyke, B. S.....	Rachel Mentzer.
Pratt.....	E. D. Thompson.....	Mabel Miller, A. B.
Prosser Preparatory School, Kansas City, Mo.....	.....	J. P. Richardson, A. B.
Reno Co., Nickerson.....	.....	E. B. Smith, A. B.
Rosedale.....	George E. Rose, B. D.....	Anna D. White, A. B.
Russell.....	T. A. Edgerton.....	W. L. Bowersox.
Sabetha.....	George O. Kean.....	Susie M. Guild, A. B.
Salina.....	George R. Crissman, A. B.....	John Lofty, A. B.
Scott Co., Scott City.....	.....	J. C. Anderson, B. S.
Scranton.....	John Linn.....	Mary J. Chapman.
Sedgwick.....	R. A. Hampshire, M. S.....	R. A. Hampshire, M. S.
Seneca.....	C. C. Starr, B. S.....	Pearl McCurdy.
Sheridan Co., Hoxie.....	.....	R. G. Mueller, A. B.
Smith Center.....	H. H. Gerardy.....	T. H. Hooper, A. B.
Solomon.....	.....	Rhoda Field, A. B.
Stafford.....	A. L. Stickel, A. B.....	.....
Sterling.....	George L. Seeley, A. B.....	Jennie M. Inches, Ph. B.
Stillwater, Okla.....	W. C. Jamieson, A. B.....	Martha Dunn.
St. John's M. S., Salina,	S. M. Grisnold, S. T. D.....	R. H. Mize, A. B.
St. Joseph, Mo.....	.....	R. H. Jordan.
St. John.....	.....	Nellie Funkhouser.
St. Marys.....	George T. Beach, A. M.....	E. S. Francis.
Stockton.....	G. M. Brown.....	.....
Sumner Co., Wellington,	.....	Thomas W. Butcher, A. M.
Syracuse.....	E. T. Ewing, A. B.....	D. E. McCrory.
Thomas Co., Colby.....	.....	W. E. Ray, A. M.
Topeka.....	L. D. Whittemore, A. M.....	H. L. Miller, A. B.
Valley Falls.....	E. B. Gift.....	Maud Myers.
Wa Keeney.....	Charles H. Mull.....	Katherine Hend.
Wamego.....	A. J. Beatty, B. S.....	Grace Eaton, A. B.
Warrensburg, Mo.....	W. E. Morrow, B. S. D.....	C. A. Burk, Pd. M.
Washington.....	W. D. Vincent, A. B.....	Carl H. Myers, A. B.
Waterville.....	S. L. Soper.....	Esther McKelvy.
Wentworth Mil. Acad., } Lexington, Mo..... }	S. Sellers, A. M.....	W. M. Haze, A. M.
Wetmore.....	W. W. Wood, A. B.....	Hulda S. Ise.
Wichita.....	R. F. Knight, Ph. B.....	B. F. Dunkin, A. B.
Williamsburg.....	J. F. Lyon.....	Grace Thestrup.
Wilson.....	H. Coover.....	Katherine Wilder.
Winfield.....	J. W. Spindler, A. M.....	S. C. Bloss, A. B.

## Entrance Requirements Defined.

### ENGLISH. Three required units.

The requirements in English for admission to the University of Kansas comprise only English literature (classics, not text-book) and English composition.

The list of classics recommended for the examinations occurring in September, 1904, and September, 1905, is as follows:

#### FOR GENERAL READING AND COMPOSITION WORK.

Shakspeare—The Merchant of Venice.  
 “ —Julius Cæsar.  
 Addison—The Sir Roger de Coverley Papers.  
 Goldsmith—The Vicar of Wakefield.  
 Coleridge—The Rime of the Ancient Mariner.  
 Scott—Ivanhoe.  
 Carlyle—Essay on Burns.  
 Tennyson—The Princess.  
 Lowell—The Vision of Sir Launfal.  
 Eliot—Silas Marner.

#### FOR CAREFUL STUDY.

Shakspeare—Macbeth.  
 Milton—Minor Poems (Lycidas, Comus, L'Allegro, Il Penseroso).  
 Burke—Speech on Conciliation with America.  
 Macaulay—Essay on Milton.  
 “ —Essay on Addison.

For the years 1906, 1907 and 1908 the list is slightly changed by substituting for the Vicar of Wakefield Irving's Life of Goldsmith, for Macaulay's Essay on Milton Macaulay's Life of Johnson, and for The Princess three of Tennyson's Idylls of the King, namely, Launcelot and Elaine, The Passing of Arthur, and Gareth and Lynette. To the reading list is added Scott's Lady of the Lake, and Macbeth and Julius Cæsar are interchanged in position.

It has further been advised that training in composition should be oral as well as written, and continuous through the high school; that text-books in rhetoric be used with discretion, chiefly as guides in the practical study of expression and for reference; that the studies of composition and of classics be correlated throughout the high-school course in the proportion of about three recitation periods weekly of classics to two of composition; and that the length of the course as recommended be three years.

## THE STUDY OF CLASSICS.

It is intended that the suggested list of classics shall be varied at pleasure, and that it shall be freely supplemented with other books of similar character, and with the collateral outside reading of biography and history. The arrangement of books and the order of study is left to the teacher, and must vary with circumstances. In general, the order of advance may be from more modern to earlier authors, American before English, or from prose to verse, or from narrative and concrete types to reflective and abstract ones; or, since these principles cannot all be applied at once, any combination of them may be made that will give an order that under existing conditions seems to afford the easiest approach to successive difficulties, and that will at the same time coordinate the study with that of composition.

No text-book, other than the editions of the classics themselves, should be used in connection with any part of this work except for reference with regard to matters of history and biography and for review at the end of the course. A work so used for reference and review should be, not a collection of biographies strung together on a bare thread of chronological sequence, but a general analysis and survey of the entire field of English and American literary history, in which mere biography is subordinated to the tracing of the growth of literary movements and of their causes and results, and of their relations to one another. As the state text-books in English literature have been and are very largely biographical, they may very well be supplemented by placing in the school library such text-books as those of Pancoast or Simonds, and more comprehensive works, such as Saintsbury's *Short History of English Literature*.<sup>\*</sup> But the objects of the course cannot be met by making of the study of any text-book an end in itself; text-books are intended only as aids in the study of classics and in the final assigning of each of these classics to its place in its own proper period and in the general history of English literature as a whole. The reading of these classics is the principal thing; this reading to be accompanied with such discussion as will best serve to lead students to appreciate, first the subject-matter and the general relations, historical and personal, of the books read, and then their form, spirit, and style.

If it is assumed that the high-school course is to include only the books named in the preceding list, it is evident at once that it is not easy to arrange them in an order that will accord with the preceding suggestions. The books assigned for class study comprise no fiction or simple verse, such as is easiest to begin with; and in the entire

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<sup>\*</sup> For further list of similar books, see the handbook named at the end of this section.

list American literature is represented by only one short poem. Even if it be assumed that American fiction and American verse have received some distinctive attention in the grades, and that grade pupils have learned how to enjoy and appreciate books read at home, and how to think and talk about them, the fact remains that the list is far too short to afford material representative of either periods or literary types with anything like the fulness that is desirable. On the other hand, if one proceeds to supplement the list, there is danger that so many books will be added that there will not be time for the thorough study of any of them; the list should be too short rather than too long.

If in the grades classics are used early to supplement the reading book and made to displace it wherever practicable, pupils, when they enter the high school, may be already familiar with Irving, Hawthorne, Longfellow, and Whittier, with some of the best work of Burroughs, Thompson-Seton, and even of Kipling and Stevenson. But if preliminary reading and training have been wholly or partly lacking in the grades, it may be expedient, before taking up the classics prescribed for careful study in the high school, for pupils to spend some time upon a part of the fiction and the modern verse in the home-reading list in order that such of them as need it may learn how the outside reading and study may profitably be done. Afterward, when regular work begins on the books prescribed for class study, the outside reading should be constantly tested by making it as often as necessary the subject of class discussions and of written reports and essays. Although not specifically mentioned in the reading list, the outside reading is always to include biographical and historical matter relating to the authors, the texts, and the periods represented in the regular list.

An order of study for the classics in the recommended list, arranged in general accordance with the preceding suggestions and without additions of any kind, might be as follows. Books that may be read at approximately the same time are placed in the same horizontal line. The spare time shown in the right hand column may be filled with general reference reading.

## IN CLASS.

Eliot.—Silas Marner; parts, or general survey and discussion.

Lowell.—Vision of Sir Launfal, entire; rapid reading and general discussion.

Macaulay.—Essay on Addison.

## OUT OF CLASS.

Eliot.—Silas Marner, completed.  
Scott.—Ivanhoe; while Lowell is under discussion in class.

Tennyson.—The Princess.

IN CLASS.

Macaulay.—Essay on Milton.

These studied as examples of Macaulay's style and method; the information given about Milton and Addison of secondary value.

Burke.—Speech on Conciliation; as an example of Burke's style and of his method in argument.

Goldsmith.—Vicar of Wakefield; in part, but enough to enable class to note peculiarities of eighteenth-century style.

Milton.—Minor Poems; compared with verse of nineteenth century.

Shakspeare.—Macbeth; intensive study.

OUT OF CLASS.

Coleridge.—The Ancient Mariner.

These read after Lowell, while Macaulay is under discussion in class.

Carlyle.—Essay on Burns; to follow Macaulay, while Burke is being studied in class.

Goldsmith.—Vicar of Wakefield: completed, and compared with later fiction of Eliot and Scott.  
Addison.—Sir Roger de Coverley Papers; compared with nineteenth-century essays while Milton is continued in class.

Shakspeare.—Merchant of Venice.  
Shakspeare.—Julius Cæsar.

General chronological review.

When the recommended classics are thus tabulated, it is evident that in three years others besides these can be read, and also that the dividing of the course into one-year units is a matter that may be governed entirely by circumstances or by the convenience of the teacher. The course should be viewed as a whole and taught as a whole without other than necessary reference to years and terms. If the indicated order be followed, perhaps the most convenient division would end the work of the first year with Macaulay and Coleridge, that of the second with Milton and Addison, and would give the third year to Shakspeare and to the general historical review. The place of any single classic in the series may be determined partly by its difficulty, partly by its date, partly by the class to which it belongs and its relation to the work that the class is doing in English composition, and partly by the specific purpose toward which the teacher desires to utilize it; and these things determine also how it is to be treated. If, for instance, Burke's Speech on Conciliation were regarded simply as an example of argumentative process, it might be placed at the end of the high-school course, since argument is likely to be the last subject taken up in the collateral high-school course in composition. But, regarded as an example of eighteenth-century prose, Burke is far easier to interpret than is either Milton or Shakspeare, and may with advantage be read earlier. Structural analysis may then be confined to making a general outline of the

argument, while attention is directed chiefly to the style and personality of Burke, and to the dramatic and heroic elements in the speech itself. At any time afterward the class in composition may take up some part of the speech or all of it as a study in argument, and may then carry the logical analysis of it as far as is desired.

The indicated arrangement is such that as a rule no classic is read at home until part of it, or until a similar one, has been studied in class. The object of this is to insure a fuller appreciation of the books read at home. That the pupil may in his class study have passed on to another type of literature, does not make any difficulty. When a classic has been assigned for home reading, a recitation period may be spent in the preliminary discussion of it, and essay subjects relating to it may then be assigned; when the home reading of it is completed, at least one or two recitation periods may be spent in reviewing it, and some of the essays may then be presented in class. Whenever time presses, a longer classic, the reading of which has been begun in class, may be completed out of class, provided, always, that the teacher sees to it that, by means of final discussion or otherwise, the work shall be understood as a whole, and that its literary or artistic unity shall be the chief thing to be impressed on the minds of the pupils.

The study of the books recommended for class use is intended to be much more thorough and much more critical than the study of those recommended for home reading. It must be systematic, and yet no single system or method can be made to apply to all the books studied. Indeed, it might almost be said that if a method of study proves satisfactory with one book or class, or in the hands of one teacher, that is a reason for doubting that it will be satisfactory with another book or class or teacher. Yet, whatever the method, however thorough and however critical, it may still be said that nothing in its application must for a moment be permitted to obscure the perception of the literary or artistic unity of the work studied. To this end it is usually well to seek, first of all, if a book is to be studied in class, for a grasp of it as a complete work; first, to give necessary explanations and directions, and necessary ones only—to give possibly an outline or a summary of it—and then to require a rapid preliminary reading of the entire book outside of class before the careful class study of it is begun. Then, after discussion of the general form and significance of the work, may follow the close, detailed interpretation of the thought from beginning to end; and after that the study of special critical questions, such as those relating to details of structure, qualities of style, the spirit of the work, the author's personality, the circumstances attending its production, and so on. Finally, after spending not too much time in

the study of such matters of critical detail as may be most important with regard to the work under consideration, it should be briefly reviewed in the new light thus afforded, and the last look, like the first one, should take account of it and appreciate it as a whole and photograph it in the memory as such.

Before a classic is read, there should be only such reference reading as is necessary for the general comprehension of it; no information that may be had from the work itself should be sought from other sources beforehand. Such reading is likely to be historical rather than biographical; the reading of the life of the author of a classic may often be reserved till after the classic is read, and the reading of criticism of both author and classic is ordinarily to be avoided altogether. A badly edited classic commonly contains too much editorial matter rather than too little, and, in some instances, the conventional biography of the author should be omitted, or placed at the end of the book rather than at the beginning, so that thereby the impulse to read the biography before the book might be counteracted.

While certain things have been indicated, here and in the supplementary recommendations stated at the beginning, as belonging in general to the critical study of literature, in taking up the study of any particular classic the teacher must decide which or how many of them may profitably be considered in that instance, and must be ready on occasion to supplement them with others, always taking care, however, not to undertake too much. Some of the things that may be considered in the close study of a classic, to follow preliminary reading and reference reading, are these:

A.—The meaning of the classic: interpretation and abstract; the clearing up of all difficulties of words and phrases, figures and allusions; the analysis of logical structure, the determining of the important events and characters and of the central lesson or purpose of the entire work.

B.—The method of the classic, logical or artistic; after the interpretation is completed, deciding to what type or class of literature it ultimately belongs, and developing as far as may be some of the principles upon which that classification is based.

C.—The style of the classic; study of selected passages, to note distinctive peculiarities of language or structure, and to determine which of them contribute to the merit of the work or throw light upon the personality of the author.

D.—Relation of the author to the classic; the study of his purpose and motive and of his reasons for his choice of subject and of form, of his attitude toward his work, his general habit of thought, and so on.

E.—General relations of the classic, historical and literary; after the collateral reference reading is completed, study of the historical basis of the work, its place in literary development, its influence, and so on.

F.—General review and summary of whatever matters have been taken up for special study; selection of best parts and passages, and general estimate of the literary value of the work.

Topics A and F of this list should be included in the study of any book, and with beginning classes and with books of less importance they are sometimes the only ones that need receive attention. But usually topics D and E should be added, and then, with classes a little more advanced and with suitable books, B, and finally C. When a new topic of study is introduced, it may receive a greater proportion of time than those which have already become familiar. Some topics include a great number of more or less technical details, but interest in these must not be allowed to divert attention from more important matters, such as the central meaning of the book, its distinctive purpose, relations, and merit.

#### THE STUDY OF COMPOSITION.

The correlation of the studies of composition and of classics consists not alone in carrying the two studies on side by side, but in making use of the books read to illustrate principles of expression which students may apply in their own speech and writing, in assigning subjects which will require independent critical reading of books in hand, or reading for information on special topics, and, as far as convenient, in keeping to the same general order of subjects in both studies, so that the work done in each may reenforce that of the other. Abstracts and summaries of books read aid pupils to grasp the central thought, the essential unity, of each book; and exercises in paraphrase and metaphrase aid in specific interpretation and in developing vocabulary; but all such exercises hinder the growth of that independence of view which is essential in the critical study of literature, and hence not too many of them should be required. Not all the composition exercises should be based upon the books read; to maintain and develop ease and originality of expression a large proportion of them should be based on material derived from the pupil's experience—that is, from his present or past observation; and many of them may be partly or wholly imaginative. Hence, under no circumstances should the composition work be given less than its fixed proportion of time in the high-school course; though the study may be, and should be, closely correlated with that of literature, it is an independent study, and must be pursued with reference to its own independent ends. These ends are practical rather than literary; the object of school training in composition is not to create literature or to make so-called fine writers, but to aid pupils to express thought with readiness and ease, in good English, in the manner most suitable or most effective with regard to the subject, the occasion, and the person or public addressed.

Composition and rhetoric are not to be regarded as distinct subjects in the high-school course. A rhetoric is merely a text-book in composition, a compend of the theory of which the composition is the practical application, and the use of such a text-book, in the study of composition as well as in that of literature, is entirely an incidental matter; the principal part of the work must always be the practical part—the preparation and discussion of oral and written exercises. An exercise in expression of some kind, written or oral, longer or shorter, should be a part of every lesson; and probably at least one exercise every week should be a written exercise of some length. A good text-book will outline such practical work, will give only such theory as is indispensable for the doing of that work well, and may sometimes serve as a guide as well as a reference book; while a bad text-book—bad because it ignores the practical side of the study, or subordinates practice to theory—may still be made use of for reference. But under no circumstances, whether the text-book be good or bad, should a period ever be spent in memoriter recitation upon any part of it; unless there are practical exercises in the application of the theory, the study of rhetorical theory as a high-school subject, even for a day, is not worth while. Apart from the slight aid that it may give toward the appreciation of literature, the only use that a text-book in rhetoric can have is to help the pupil in a practical way to express himself—that is, to do something; and if the study of it does not always require this it means nothing and comes to nothing.

Many teachers will find it preferable to outline their high-school course in composition independently of any text-book, and then, in following the course day by day, to indicate to their classes such sections and exercises in the text-book as may happen to be relevant to the topic of the day, ignoring all material that does not suit their purpose, and on occasion disregarding the text-book order of arrangement. Commonly the first object to be sought for in a high-school course is to make the composition work attractive and interesting as well as practical by leading pupils to speak and write about the things that interest them, to address themselves to some one whom they desire to interest, and to choose and shape their material to this end; all this in order that they may develop readiness, ease, and confidence, without self-consciousness, in the expression of their thoughts and feelings. Not to defeat the end in view, it may be necessary to overlook for the time being such matters as bad sentences, bad diction, and bad spelling, or to give them only incidental attention, in order not to discourage pupils by dwelling too much upon their weaknesses before they have had time to learn their

strength. This beginning work may consist largely of stories—that is, of narrative and descriptive exercises, oral and written, based on observation and imagination; and stress may be placed on the selecting of material proper in kind and amount for the real or assumed occasion and public, and the shaping and ordering of it in an organized discourse, with a good beginning and ending, and well proportioned in all parts. Stories may be followed with essays presenting reflective material derived from all sources, and the shaping and proportioning of these will lead to the study of themes, plans, or outlines, and of paragraphs as parts of larger discourses.

Then may follow, with any sort of material and treatment, the study of the organism of the paragraph, and then the study of sentence organism, of diction, and of the general principles of style. Here, if not before, may be instituted the campaign against error; that is, against such firmly rooted errors as have withstood all influences hitherto brought to bear directly or indirectly. This campaign may now, if necessary, be long continued; for it is to be presumed that now pupils have become enthusiastic and not easily discouraged, and that they are quite as desirous as is the teacher to make their language correct, as well as easy and natural; and it may be that the campaign and the high-school English course may end together. Even now this destructive campaign must not be made the principal object of the work, but after that survey of the principles of style and diction with which it is associated, there may be a review of the larger principles with the study of which the course began, and a somewhat closer study of the several forms of discourse, and in particular of narrative and exposition.

In pursuing such a course as this any text-book may be used, in so far as a text-book is necessary or helpful, but no text-book should be followed too closely, and no topic or exercise assigned that does not at the moment lend itself to the immediate end in view. To give lessons to a class for no better reason than that they are to be found in the text-book is another way of wasting time. This is true of all text-books, though, with few exceptions, if any, all the more recently published text-books in composition and rhetoric are planned in accordance with the general principles here stated. Such a work as the present state text-book, published in 1896, and suited for college rather than for high school, may be used for reference upon such of its topics as are pertinent to a high-school course; and its high and conservative standard of literary taste should have a most excellent influence upon pupils. But it should be supplemented with such books as those of Webster, Scott and Denney, Herrick and Damon (edition of 1902), Mead and Gordy, Newcomer, or Espensshade (June, 1904). Other equally suitable books might be named (for full list,

see the handbook named at the end of this section); and of these here given, perhaps the Webster and the Espenshade will be found as interesting as any.

Any good text-book, not slavishly followed but used, as a text-book should always be used, for reference and general guidance, may serve throughout the entire high-school course, whether that course be one year in length or three, or even four. The high-school course in composition, like the high-school course in literature, should be planned as a whole with reference to the objects to be accomplished with a given class, under given conditions, with the facilities that may be available; and not with reference to a number of text-books, or to the number of pages or chapters in any one text-book, or to the particular character and content of any one text-book. A course in composition means constant practice in expression—that is, in speaking and writing—and the teaching of whatever an individual class or individual pupils may need to learn in order that their expression may be spontaneous and natural, practical, direct, and well ordered, in accord with the genius and usage of the language, pleasing, and in all these things suited to its purpose. In planning a course, there must assuredly be a tentative division of the whole course into years and terms, and in planning the work of a term there must be a tentative arrangement by weeks and possibly by single recitations; but such plans must be elastic, so that the work actually done in any year, term, week or recitation may be made just the work that needs to be done at that time, determined with reference to what has been already accomplished and what remains to be accomplished. Hence, lessons in a text-book properly used will consist not of pages or sections assigned to be memorized, but of topics designated to be read in connection with the working out of some assigned practical exercise, and one such topic, discussed in perhaps but a single paragraph of a text-book, may happen to be all that a class reads in the text book for weeks, while it is busied in striving for the practical mastery of the principle stated. If a text-book contains too much material or useless material, the superfluous material may be disregarded; if it does not contain all that is wanted, and no text-book ever will, it may be supplemented by the teacher or with another text-book; if the material in it is not arranged in a suitable way, the various topics may be taken up in any order that suits the purpose of the teacher. No one text-book can possibly be suited to all classes and conditions; the teacher who finds one that is suitable for his particular work is fortunate, while the teacher who is independent of the text-book and can use any, or on occasion dispense with any, is more fortunate still. But where

there is freedom of choice it should not be hard to find a fairly satisfactory book, or a series of them, if a series is preferred.

For the reasons stated, the following arrangement of high-school subjects by years is purely tentative and discretionary; it includes classics as well as composition, in the order already specified:

FIRST YEAR.	
IN CLASS.	OUT OF CLASS.
<i>Literature.</i> Three periods weekly.	
Silas Marner, in part.	Silas Marner, completed.
Vision of Sir Launfal.	Ivanhoe.
Essay on Addison.	The Princess.
Essay on Milton.	The Ancient Mariner.
Other books as selected.	Essay on Burns.
	Reference reading of biography, history, etc.
<i>Composition and Rhetoric.</i> Two periods weekly.	
The finding, shaping and adapting of material, in written and oral exercises; stories, letters, essays, study of theme, plan, and paragraph; beginning of the study of the sentence.	

SECOND YEAR.	
IN CLASS.	OUT OF CLASS.
<i>Literature.</i> Three periods weekly.	
Speech on Conciliation.	Vicar of Wakefield, completed.
Vicar of Wakefield, in part.	Sir Roger de Coverley Papers.
Minor Poems of Milton.	Reference reading.
Other books as selected.	
<i>Composition and Rhetoric.</i> Two periods weekly.	
The principles of style, in written and oral exercises; stories, letters, essays, study of sentence structure and of choice and use of words, study of paraphrase, translation, synonyms, figures, verse forms, etc. If necessary, there may be a review of grammar in this connection.	

THIRD YEAR.	
IN CLASS.	OUT OF CLASS.
<i>Literature.</i> Three periods weekly.	
Macbeth.	Merchant of Venice.
Other books as selected.	Julius Cæsar.
General historical review.	Reference reading.
<i>Composition and Rhetoric.</i> Two periods weekly.	
Principles of style continued, and review of the forms of discourse; stories, letters, essays, study of nature and principles of narration and description, exposition and argument.	

To secure the continuous study of English through the four years of a high school either of two methods may be followed. If practicable, it is of advantage for all students, and particularly for such as do not afterward enter college, to add a fourth year of English to the three full years herein described as a college-entrance requirement. If this is not practicable, the three years' work may be distributed through four years by assigning to it fewer than five recitation periods a week in the last two years, so that the total time given it is not increased.

#### COLLEGE-ENTRANCE CERTIFICATES AND EXAMINATIONS.

Since the high-school English course includes a number of distinct subjects, each having its distinct value and not interchangeable with the others, since the results of the work depend altogether upon what is done and how it is done and not at all upon what books are used, and since, when a high-school student enters college, it is necessary to know exactly what he has done in English in order to determine what his English work should be after he enters, it is of the first importance that the English report in his entrance certificate shall show all this fully and specifically.' A report showing merely that a student has had three years of English is little better than no report at all, for three years of English may mean any English subject, and any kind of work, from the best to the most worthless. To show in addition the time given to each subject is still insufficient; for if that time has been spent in the study of text-books without practical application of text-book principles in the study of literature, in speaking, and in writing, it has been spent to little purpose. A difficulty exists here which is not found in any other subject than English; for in other subjects the meaning, the purpose, and the general character of the necessary training have as a rule been so thoroughly determined by long usage that no possibility of misunderstanding exists. In English a sudden and very recent change has taken place; formerly regarded as the easiest and least important subject in any school or college, and neglected or taught at haphazard by any teacher who could spare a little time, it has now become established as one of the most important subjects and one of the most difficult to teach, requiring the very best of teachers; and because this change has been so recent it is impossible as yet to assume that uniformity in practice and in the use of terms which exists with regard to other high-school subjects.

For this reason a special form of report has been devised for the high-school certificate in English, not only showing the time given to each subject in each year, the text-book used, if any, and the grade of the student, but, in addition to these, indicating the amount of practical work done. This form is substantially as here shown:

ENGLISH.				Number of weeks..	Number of periods weekly	Length of periods..	Grade .....	Name of teacher...
FIRST YEAR.	Literature	{ Number of classics read—	{ In class— At home—	.....	.....	.....	.....	.....
	Rhetoric and composition	{ Text* .....	{ Av. length in words—	.....	.....	.....	.....	.....
	Themes: Number—			.....	.....	.....	.....	.....
	Grammar,† if reviewed; text .....			.....	.....	.....	.....	.....
SECOND YR.	Literature	{ Number of classics read—	{ In class— At home—	.....	.....	.....	.....	.....
	Rhetoric and composition	{ Text .....	{ Av. length in words—	.....	.....	.....	.....	.....
	Themes: Number—			.....	.....	.....	.....	.....
THIRD YR.	Literature	{ Number of classics read—	{ In class— At home—	.....	.....	.....	.....	.....
	Historical review; text .....			.....	.....	.....	.....	.....
	Rhetoric and composition	{ Text .....	{ Av. length—	.....	.....	.....	.....	.....
Themes: Number—				.....	.....	.....	.....	.....

\* Pages or parts of a text may be specified, or subjects may be named.

† Not a part of formal requirement.

It is evident that to make this report complete there must be a careful record kept of the exact nature of the English work done in each high-school year, and this is precisely the point aimed at; if the report shows only that so much "English" has been done, further information must be obtained from other sources before the proper disposition can be made of the student. If his English work in any subject has been text-book work only, he will probably be conditioned in that subject; if it is deficient in one subject and overfull in another, his college work in Freshman year must be so shaped as to make good the deficiency. Every detail of the report is therefore necessary and important, and should be carefully supplied; and not until particulars are supplied in some way can the University determine what "English" means in the case of any one high school, and what college work in English a student from that school should be prepared to enter upon.

To state the number of classics read and of themes written is of course merely an approximate indication of the amount of prac-

tical work done, but it is perhaps as satisfactory as any. Too few or too many classics read implies lack of thoroughness. In estimating the number and length of themes, oral exercises may be taken into account as well as written ones. It will be noted that the formal study of a text in literature is not expected until the third year. The use of a text-book in composition is not obligatory, and one text may serve for the entire three years; but the report may state the subject studied each year, or the part of the text-book used each year.

Students who present themselves for admission without certificates will be examined as indicated in the official statement quoted at the beginning of this section. Applicants from high schools having four full years of English in the curriculum may take a special examination for advanced standing or college credit, as such credit cannot be given on certificate. Blank certificates will be furnished by the registrar of the University on application.

#### REFERENCE WORKS ON TEACHING.

Two comprehensive works on the teaching of English have recently been published, one by Chubb (Macmillan, 1902), and the other, more recent and more complete and including a valuable bibliography of the subject, by Carpenter, Baker, and Scott (Longmans). A convenient little reference book on methods of teaching classics is Heydrick's *How to Study Literature* (Hinds & Noble). The University department of English has prepared a *Handbook on the Teaching of English*, with especial reference to the University requirements and the conditions of the state high schools. This, besides discussing more fully some principles and methods of teaching literature, composition, and language, indicates the relation of high-school English to that of the lower schools as well as that of the college, outlines fuller courses in English than that herein described, and includes an extended classified and descriptive list of text-books and reference books in every English subject, with their publishers, dates, and prices. It was published in February, 1904, by Scott, Foresman & Co., Chicago, and will be sent by the publishers or by the University to any English teacher on application accompanied with five cents for postage.\*

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\* The department has also prepared a theme and essay tablet for use in high-school composition teaching with any text or without a text, published by O. P. Barnes, 378 Wabash avenue, Chicago. Price, fifteen cents; with portfolio, twenty-five cents.

**LATIN.** Four units.

Either three or four of the following units may be offered:

1. The Beginner's Book.
2. Four books of Cæsar, and Latin prose composition.
3. Six orations of Cicero, and Latin prose composition.
4. Six books of Vergil's *Æneid*, and Latin prose composition.

A full year must be given to each of these units.\* No credit is given for one or two units, unless the deficiency is made good after the student enters the University. If three units are offered, it is preferred that they be 1, 2, and 3; but 1, 2, and 4 will be accepted. No combination of Cicero and Vergil will be accepted as one unit.

**The Beginner's Book.** The all-important thing in the first year is that the pupil shall acquire a perfect knowledge of the forms of declension and conjugation. This means the ability not merely to repeat the paradigms correctly, easily, and rapidly, but to recognize instantly and certainly each case and verb form when met in isolation. Vocabulary and syntax are important, too, but they can be learned in later years; while a pupil who gets through the first year without learning the forms has little prospect of ever learning them. And no pupil who has to stop and think out or look up the identity of the forms he meets in his reading can ever read easily. There is only one way to teach this command of forms, namely, drill—drill at the first occurrence of a paradigm, drill in the regular reviews, drill at unexpected times all through the year. The teacher who cannot stand the drudgery of drills ought not to teach beginning Latin. Analysis into stems and endings may help some pupils a little, but it cannot take the place of thorough drilling. Besides the frequent repetition of paradigms, there must be many exercises in the recognition of isolated forms, given either orally or on the board. No beginner's book gives more of these exercises than are sufficient to serve as models.

In the first year the pronunciation is fixed, and it is as easy to fix the right one as a wrong one. The Roman method is of course the only one possible at present. A perfectly accurate pronunciation requires that long vowels be given twice the time given to short vowels, whether accented or not. This is contrary to English usage, and, for this reason, is so difficult that few teachers attempt it. But it is very easy to distinguish in quality between long and short vowels, especially as most preparatory books indicate the quantities; and there can be no possible excuse for permitting incorrect accents. Requiring pupils to mark the long vowels in all written work is helpful, but will have no effect if they hear and use an incorrect pronunciation. The teacher should spare no pains in perfecting his own

pronunciation; and he should always read to the class the Latin words in the next day's lesson, and make sure that every pupil knows the correct pronunciation of every word before he learns it.

A good feature of the book adopted for use in the high schools of this state is the connected passages of easy Latin scattered through the book as reading lessons. Under no circumstances should these be omitted. The transition from a beginner's book to *Cæsar* is difficult at best, and all the more so if the pupil has read no connected Latin in his first year.

**Cæsar.** If the work of the first year has been done well, *Cæsar* is not too difficult an author to follow the beginner's book immediately. If *Cæsar* is read intelligently, he is very far from being too dull and monotonous for a year's work. Under these conditions it is best to read, without substitution, four books of *Cæsar*, or selections from the entire seven books equivalent in amount to the first four. Books V-VII are more interesting than books I-IV, and the teacher who is weary of I-IV may well omit portions of them, especially I, 30-54, and substitute such portions of the later books as V, 1-24; V, 24-52; VI, 11-28; VII, 66-90. But if the teacher desires to make a partial substitution of some other author, the University will accept in place of one book of *Cæsar* an equivalent amount of *Viri Romæ* or *Nepos*. Any of the second-year books offer an acceptable substitute for *Cæsar* to schools which are not bound by the action of the Text-book Commission.

At the end of the second year the pupil should have an accurate working knowledge of all the common uses of the cases and modes. Therefore it is unavoidable that a drill on syntactical constructions should receive the chief attention during the reading of *Cæsar*. But if Latin prose composition is properly emphasized it will carry a large part of this burden, and will leave the class some time for getting at the contents of *Cæsar's* story. It is a great mistake to make nothing but a grammatical drill-book out of *Cæsar*.

The teacher will find it helpful to keep on his desk one of the several good editions of *Cæsar*. Perhaps Allen and Greenough is the best for this purpose.

**Cicero.** The six orations should include the four against *Catiline* and the one for the *Manilian Law*. The one for the Poet *Archias* may be recommended as the sixth. If a partial substitution is desired, *Sallust's Catiline* may be read instead of the *Manilian Law* and the sixth oration. This gives variety in the year's work and makes the setting to the *Catiline* speeches more vivid.

The syntactical drill cannot yet be subordinated, but it ought not to require so much time as during the second year. Pupils should make

written abstracts of the speeches, so that they may get the contents of each as a whole; should be encouraged to read the Latin aloud with rhetorical emphasis; and should in every possible way be led to appreciate the fact that they are reading great speeches, not disconnected pages of Latin sentences.

**Vergil.** If the pupil has come up to the study of Vergil without a good working knowledge of declension and conjugation forms and of case and mode uses, he is to be pitied. There ought to be too much to do to permit of much grammatical drill. This is the reason why Vergil ought always to follow Cicero in the course, not precede. Opinions may differ as to whether pupils find Cicero or Vergil the more difficult, although a comparison of scholarly editions will prove that editors at least find Vergil vastly the more difficult. But while reading Cicero any teacher can find plenty of time for grammatical drill; while reading Vergil he ought not to be able to do so. And in his third year of Latin a pupil must have grammatical drill. If read in the fourth year, grammatical drill may be confined almost wholly to the period devoted to Latin prose composition.

First and foremost, the pupil should get the contents of the story. Fortunately few teachers fail to let their pupils do this in Vergil, however they may treat Cæsar and Cicero. Yet an occasional college student will say that he does not know whether or not he has read the story of Æneas's descent to the lower world. Secondly, the pupil must learn to read Vergil metrically. This does not mean that he should be taught painfully to divide the lines into feet, giving a reason for each step, and then be left to imagine that he has thus "scanned" Vergil. He should be taught to read the lines as smoothly and intelligently as so much English poetry; and this is no difficult feat. Only then will he feel that Vergil wrote poetry. It is not necessary to learn all the rules of quantity laid down in the grammars. If he has been taught to discriminate between long and short vowels in his usual pronunciation he will have no trouble at all. If not, *Auxilia Vergiliana*, a little pamphlet published by Ginn & Co., shows how a few rules, well used, will carry him through almost all lines; and an occasional reference to the vocabulary will clear up the rest. If the teacher is a convert in theory to the doctrines of Hale (as the writer is) or of Bennett, let him nevertheless begin by teaching the old-fashioned way, with an ictus on the first syllable of each foot, and no word accent. Few pupils will make music of Vergil's verse on any other plan. Thirdly, the pupils ought to learn a good deal of mythology—not theories about the origin and meanings of the gods, but the stories which form so integral a part of much of our English literature. In addition to these main topics there are innumerable questions on matters literary and

archæological which will occur to the teacher who knows the literature of his subject. Many of these will serve to interest and stimulate the pupil.

The teacher will find help in a desk copy of Knapp (Scott, Foresman & Co.) or Greenough and Kittredge (Ginn & Co.)

**Latin Prose Composition.** Although the goal in the study of Latin is the ability to read, rather than to write, the language, yet accurate reading is impossible without a good command of vocabulary, form, and syntax; and this can be acquired by no other method so surely and quickly as by the writing of Latin.

No manual of prose composition has been adopted by the Text-book Commission, and the teacher may therefore choose the one best adapted to his needs. There are two systems in vogue. Such books as Jones's Exercises in Latin Prose Composition (Scott, Foresman & Co.) and Bennett's Latin Composition (Allyn & Bacon) take up the principles of syntax in logical order, as they are given in the grammars, and give sentences which call for the practical use of these principles. Their chief purpose is to insure a systematic study and comprehension of the syntactical portion of the grammar. Such books as Daniell's New Latin Composition (Sanborn & Co.) and Moulton's Preparatory Latin Composition (Ginn & Co.) base their exercises closely on the text of Cæsar and Cicero, so that the pupil uses the words and constructions found in the portion of the text just read. Their chief merits are that they give practice in writing connected passages as well as disconnected sentences, and that they encourage the pupil to study closely the text he is reading. But these merits seem outweighed by the fact that they are necessarily less systematic in presenting the principles of syntax, although Daniell's attempts with some success to remedy this defect. If a specific recommendation is desired, our preference would be for the whole of Bennett, supplemented if possible by frequent exercises dictated from Daniell. This amount is not too large for the best interests of the pupil; since the more composition is emphasized the less needful it is to make mere grammatical drill-books of the Latin authors.

The requirement of the University is that the equivalent of one period a week be given to composition throughout the second, third, and fourth years. Individual experience must determine how this shall be divided. The most usual method, and perhaps the best, is to give it one period a week. Sometimes it is scattered out, so that a little is done every day; but this is likely to make the work too scrappy and to lead to its neglect. A few teachers spend several weeks together on composition alone, usually at the end of the year, and justify the plan on the ground that it interests the pupils more.

This is no doubt true. The dislike felt by most pupils for composition is largely or wholly due to the fact that they do so little of it that it never becomes easy. But it must be remembered that composition is practiced as an aid to reading, and this aid is lost unless the reading is carried on side by side with the writing.

If such a book as Daniell's is used, the exercise assigned should always be the one based on the portion of the text just read by the class, even if some exercises have to be omitted. To let the writing lag far behind the reading defeats the purpose of the method.

**Translation.** If translation is done well it is a better training in English expression than can be obtained from original composition on the part of the pupil; for in original composition he can usually avoid expressing at all any idea which he cannot express easily, while in translation he is forced to give expression to every idea of his author. There is therefore a sad waste of opportunity if the teacher allows himself to be satisfied with slipshod, slovenly translation. Yet the mistake is prevalent, for "translation English" has become a synonym for a certain kind of language which is never heard outside of the classroom except for humorous effect. It consists in part merely of the overworking of some very good words and phrases. A modern general might sometimes urge or encourage his men: Cæsar always exhorted his. We sometimes cannot do things: the ancients were always unable to do them. A worse feature of "translation English" consists of so-called "literal translations" of Latin idioms. Some teachers even require such renderings, although monstrosities like "he said himself to be about to go" are not English at all, and therefore are not translations. A good classroom translation must be good English, and should at the same time show the disposition made of each word of the original. If one quality must be sacrificed let it be the latter, and let the teacher satisfy himself by questions that the pupil understands the Latin. But the pupil cannot always make a good translation unaided, even if he understands the Latin. This is the best reason for invariably reading the review lesson. On the advance lesson he must be expected to stumble and must be helped. But on the next day he should be required to read through the lesson as smoothly and as perfectly as if he were reading so much English.

Too many teachers unconsciously have the habit of correcting translation by interjecting words and remarks while the pupil reads. If the pupil has prepared what he considers a good translation, this practice both irritates and discourages him. If he has not, it encourages him to prepare his translation in a slipshod way, trusting to hints from the teacher to carry him through. In either case, neither the pupil who recites nor the rest of the class can fit the

teacher's suggestions into the pupil's translation. The pupil should always be allowed to read through, without suggestion, the portion assigned him, whether a sentence or a paragraph. The teacher should then comment on his mistakes, and finally should translate the whole properly.

**Subject-matter.** A very common and very unfortunate defect in teaching is a failure to make sure that the pupil gets a good understanding of the subject-matter of the Latin authors. To take Cæsar for example. Many pupils, many teachers even, find him dull and monotonous. No one could ever hold this opinion if he knew just what Cæsar did in each of his campaigns, and had taken the pains to study out his routes, his battle-fields, his methods, and his motives. But no history ever written would be interesting if read at the rate of half a page a day and studied solely from the point of view of his syntax. The language of Cæsar must be the main object of attention; but the pupil ought to know the story as he reads it, ought to appreciate the bearing of every new chapter on the whole, ought to trace out all the movements on the map. The failure to get such an understanding makes the author dull, makes it harder to secure an adequate translation of the passages assigned for the daily lessons, and leaves the pupil at the end of his year's work with no comprehension that he has been reading one of the world's great classics. If the average teacher feels satisfied that his pupils are getting such a knowledge of the subject-matter of the authors they are reading, he can easily test his results by an examination question. At the end of any book of Cæsar let him ask his class, without previous warning, to write out a narrative of the campaign. To judge by what most college students remember of the contents of the preparatory authors, he will be surprised at the answers, if he gets any.

The surest and best method of giving pupils this knowledge of the subject-matter is requiring them to write out in note-books brief summaries of each day's lesson, as a part of the next day's work. This should be supplemented by brief discussions, and by questions during the daily recitations and in examinations. It goes without saying that the teacher himself must have a full comprehension of the subject-matter; and this he certainly will not have unless he makes a practice of reading at a sitting a whole campaign of Cæsar, a whole oration of Cicero, or a whole book of Vergil. He will be much helped, too, by reading one or more of the books which are mentioned later.

**Sight-reading.** Sight-reading has its value, though it has been overestimated. It is not worth doing at the expense of other things;

but if there are a few minutes to spare at the end of the recitation, they may be well employed by letting the class read on into the next day's lesson without using either notes or vocabulary. This is better than taking Latin from some other source, because what is learned is fixed in the memory when the pupils read the passage again in preparation for the next day's recitation, and because it insures the attention of the whole class.

The following list contains a few of the books which, in our judgment, will be found most useful in the library of the high school or the teacher; the prices are quoted from the Publishers' Trade List Annual:

## CÆSAR.

Holmes, *Cæsar's Conquest of Gaul*, Macmillan & Co., \$6.50. The best discussion of the military and geographical problems in Cæsar.

Fowler, *Julius Cæsar*, G. P. Putnam's Sons, \$1.50. Perhaps the best life of Cæsar.

Judson, *Cæsar's Army*, Ginn & Co., \$1.

## CICERO.

Boissier, *Cicero and his Friends*, G. P. Putnam's Sons, \$1.75.

Forsyth, *Life of Cicero*, Charles Scribner's Sons, \$2.50.

## VERGIL.

Conington, *Vergil*, Macmillan & Co., 3 vols., each \$3.25. The best English edition. Volume II contains *Æneid I-VI*.

Conington, *Vergil's Poems in Prose*, Longmans, Green & Co., \$2. Dryden, *Translation*, several editions.

Sellar, *Vergil*, Oxford Press, \$2.25. The best literary criticism.

## GRAMMARS.

The teacher should have all the grammars commonly referred to, and especially Harkness, *Complete Latin Grammar* (1898), as a corrective to the 1881 edition adopted for use in the state.

## LEXICONS.

Harpers' *Latin Dictionary*, American Book Company, \$6.50.

Lewis, *Elementary Latin Dictionary*, American Book Company, \$2.

White, *English-Latin Dictionary*, Ginn & Co., \$1.50.

## DICTIONARIES OF ANTIQUITIES.

Harpers' *Dictionary of Classical Literature and Antiquities*, American Book Company, \$6 to \$10.

Seyffert, *Dictionary of Classical Antiquities*, Macmillan & Co., \$2.25.

One or the other of these books is almost indispensable.

ATLASES.

Ginn's Classical Atlas, Ginn & Co., \$1.25 to \$2.

Kiepert, Atlas Antiquus, Sanborn & Co., \$2.50.

Sanborn's Classical Atlas, Sanborn & Co., \$1 to \$1.75.

WALL MAPS.

Kiepert, get price-list from Rand, McNally & Co. The best and most expensive. Cheaper maps are advertised by the Boston School Supply Company, but the department has not examined them.

HISTORY.

(See the department of history.)

HISTORIES OF LITERATURE.

Cruttwell, History of Roman Literature, Charles Scribner's Sons, \$2.50.

Mackail, Latin Literature, Charles Scribner's Sons, \$1.25. This is itself a work of literature.

MYTHOLOGY.

Gayley, Classic Myths in English Literature, Ginn & Co., \$1.50.

Guerber, Myths of Greece and Rome, American Book Company, \$1.50.

MISCELLANEOUS.

Bennett and Bristol, The Teaching of Latin and Greek, Longmans, Green & Co., \$1.50.

Hale, Art of Reading Latin, Ginn & Co., 25 cents.

Johnston, Private Life of the Romans, Scott, Foresman & Co., \$1.50.

Johnston, Teaching of Second-year Latin, Scott, Foresman & Co., free.

**GREEK.** Three units.

*First Unit.* Elementary Greek. Gleason's Greek Primer or White's First Greek Book, or an equivalent. Thorough mastery of declensions and conjugations, and the main ideas of syntax. Xenophon's Anabasis begun, and twenty to thirty pages read. Goodwin's, Babbitt's, or Goodell's Greek Grammar.

*Second Unit.* Xenophon's Anabasis continued into or through the fourth book, or an equivalent amount of other Attic prose. Review of inflections. Systematic study of syntax in the grammar. Practice in writing Greek based on the text read. Constant training in sight-reading.

*Third Unit.* Homer's Iliad or Odyssey, five to six books, exclusive of the Catalogue of Ships. Special attention to Homeric forms, vocabulary, and scansion. Constant practice in reading at sight.

Seymour's School Iliad or Benner's Selections from Homer's Iliad. Perrin & Seymour's School Odyssey (edition with eight books). Attic prose composition once a week. Bonner's Greek Composition for schools.

#### SUGGESTIONS TO TEACHERS.

Special attention should be paid to the regular forms and constructions, the most common words and phrases and principles, leaving the irregular or uncommon to be learned when they occur in reading. Require a firm grasp of the essentials. Review and repeat, but not to weariness. Go slowly at first, yet aim to get results as fast as possible.

Help students to acquire a vocabulary, by grouping words when possible, by bringing out the English derivatives, by having them mark in both text and grammar words or principles especially to be learned, and then review them often. Don't allow a student to turn to his lexicon or grammar to look up a word or principle until he is sure that it is necessary. Have him, if possible, originate some device of his own to remember the meanings of words.

Go over as much as possible of the advance lesson each day. Have students pronounce and translate at sight; watch and teach or guide them how to read, leading them to bring forth and apply meanings of words and forms and principles of syntax they have already had and know. Explain as much as necessary, but leave something for them to do.

Have students translate the words of a sentence in the order in which they stand in the original, and make good English afterwards. In reading poetry let them use a poetic order.

Use the blackboard much; let the students see what is necessary.

Yet train the ear also. Have some oral work every day. Have students pronounce aloud, and let them translate some from hearing, especially passages already translated from the book. If possible, introduce some conversational exercises, and have students learn some Greek by heart.

Require a knowledge of the geography, history, and mythology needed to understand the author being read, and something of his life, time, and works.

A few books that ought to be at command of students and teachers:

Lord's Classical Atlas, Boston, Sanborn, \$1 to \$1.75.

Botsford's History of Greece, New York, Macmillan, \$1.10.

Bury's History of Greece, New York, Macmillan, \$1.90.

Pennell's Ancient Greece, Boston, Allyn & Bacon, 60 cents.

Butler's Story of Athens, New York, Century Company, \$2.40.

Jebb's *Primer of Greek Literature*, New York, Appleton, 40 cents.  
Capp's *Homer to Theocritus* (a history of Greek literature), New York, Scribners, \$1.50.

Jebb's *Homer, and Introduction to the Iliad and Odyssey*, Boston, Ginn, \$1.12.

Goodell's *The Greek in English*, New York, Holt, 60 cents.

Gulick's *Life of the Ancient Greeks*, New York, Appleton, \$1.40.

Harpers' *Dictionary of Classical Literature and Antiquities*, New York, Harpers, \$6 to \$10.

Liddell and Scott's *Greek Lexicon*, New York, American Book Company, \$10.

Hill's *Illustrations to School Classics*, New York, Macmillan, \$2.50.

Tarbell's *History of Greek Art*, New York, Macmillan, \$1.

Schuchhardt's *Schliemann's Excavations*, New York, Macmillan, \$4.

Tsoudas and Manatt's *Mycenæan Age*, New York, Houghton, Mifflin & Co., \$6.

*Mycenæan Troy*, Tolman and Scoggin, New York, American Book Company, \$1.

Weissenborn's *Homeric Life*, New York, American Book Company, \$1.

Leaf and Bayfield's *Iliad*, with notes, New York, Macmillan, 2 vols., each \$1.40.

Moss's *First Greek Reader*, new edition, Boston, Allyn & Bacon, 70 cents.

Dickinson's *Greek View of Life*, London, Methuen, \$1.

## **GERMAN.** A three years' course.

### FIRST YEAR.

**Text-books Suggested:\*** Carruth's *Otis's German Grammar*, Henry Holt & Co., New York (supplemented if desired by further exercises in Becker's *Elements of German*, Scott, Foresman & Co., Chicago), and Carruth's *German Reader*, Ginn & Co., Boston.

### **Objects of the First Year's Work.** (1) To obtain a thorough

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\*The books recently adopted by the School Text-book Commission serve only for a part of the first two years. Unfortunately the law was not drawn with a view to two- and three-year courses, and accordingly the commission has adopted a book of exercises, but no reader. Practically, every teacher of German uses a grammar and a reader in the first year. Accordingly, the course here recommended introduces the state text in grammar, makes a place for the exercise book for those who use such in addition, and outlines the work in a reader. The detailed programs of work are given only for the benefit of new teachers, though they may be found helpful to all. Of course, experienced teachers will adapt any such plan to the needs of individuals and classes. In any case, it is wise to explain in advance to the class the purpose of the work, the method to be pursued, and the general distribution of it.

knowledge of elementary grammar with practical application to the printed and spoken language; (2) to obtain a good German pronunciation and ability to use German script with accuracy and moderate ease; (3) to acquire familiarity with a limited German vocabulary as employed both in standard German prose and in ordinary conversation; (4) to begin an acquaintance with good German literature and with German popular songs; (5) to learn to carry on conversation in very simple German on every-day topics.

**Distribution of the Work.** There should be a German recitation every school-day of the thirty-four working weeks of the school year. These 170 recitation periods may wisely be distributed as follows:

Introductory (talk about the language, illustrations, introducing phrases for conducting recitation in German, pronunciation, etc., lesson I of the Grammar) ..	5 periods.
Grammar (twenty-three lessons, two periods to each) ..	46 "
Review of grammar .....	20 "
Reader (sixty pages, from one-half page daily to two pages daily, including review) .....	44 "
Exercises (in reader or in state text, or both, including reviews) .....	28 "
Dictations and learning songs .....	22 "
Final review .....	5 "
<b>Total .....</b>	<b>170 periods.</b>

### *First Term.*

#### PROGRAM OF THE WORK.

First week: Introduction (Lesson I) .....	5 periods.
Second week to fifth, inclusive: Grammar, seven lessons (including VIII), fourteen recitations, with six more for review .....	20 "
Sixth week to seventeenth, inclusive: Grammar, three periods weekly first six weeks, two periods weekly last six weeks, to lesson XVIII, inclusive; twenty periods first time, ten on review .....	30 "
Reader, two periods weekly for twelve weeks, divided between reading and exercises on the reading, covering ten to twelve pages of Carruth's Reader .....	24 "
Dictations, one weekly, last six weeks .....	6 "
<b>Total .....</b>	<b>85 periods.</b>

**Conduct of Lesson II in Carruth's Otis's Grammar.** First recitation (after a week of introductory drill in pronunciation). Assign to and including the German exercise II (one-half or more), and in assigning read over slowly and carefully the model sentence, §2, and the words of the vocabulary. (This practice of reading the vocabulary should be kept up for the first eight lessons.) Admonish class to read the German sentences over aloud in studying them.

*Recitation.*—Require the recitation of the model sentence from memory; be sure that the pupils understand the cases and their uses. Call for the statement of the grammatical facts included in the text of the lesson. Have the class recite the definite article, singly and in concert; have the declension given both downward and across; that is, by genders and by cases.

NOTE.—In connected speech the *e* of the article is slurred (see page 6 of the grammar), but in recitation of the forms the *e* should be pronounced distinctly, long before *m* and *n*, short before *r* and *s*.

The vocabulary may be read, or the German words required on giving the English; or, in case of the nouns, the pupils may be required to give the correct article with the noun when the teacher has spoken the noun alone. The class should recite the present tense of *sein* singly and in concert. The sentences of the German exercise should then be read by pupils in turn. The pupils may turn them into English, or simply be asked about the forms of the articles used, or both. In the first lessons, constant attention must be paid to pronunciation in reading the German sentences.

**Second Recitation on Lesson II.** Assign the writing, in German script, of one-half or slightly more of exercise 2, the preparation of continuations of the specimen sentences in conversation 1, the memorizing of the *Sprichwort* and the poem *Das Glueck*. In assigning the lesson these should be pronounced by the teacher. Also a review of the forms of the definite article and present tense of *sein*.

*Recitation.*—Send pupils to board to copy from their papers the sentences of exercise 2. When all are written, go over the sentences on the board and correct, asking class to suggest corrections and explaining, and requiring pupils to make corrections accordingly on their own papers. At close of recitation the teacher should take up these papers and correct them carefully, to return at the next recitation.

NOTE.—The teacher should take up and correct the papers himself for at least the first eight lessons. After that the class may be trusted to make its corrections in the class, but the papers should be taken up once a week throughout the first year.

Recite again, and have some of the pupils write on board, the definite article and the present tense of *sein*. Use conversation 1, the teacher asking the questions and requiring the pupils to reply, using the entire vocabulary to the conversation. Have the *Sprichwort* and the poem recited in concert. The second half of the exercises should be done in the review, together with renewed recitation of the grammatical forms.

**Lesson III.** Assign as in lesson II, through one half of the

German exercise for one recitation. In this recitation the exercises of lesson II are given back corrected.

The second recitation on lesson III will be assigned as on the second half of lesson II, but in addition the pupils are to be required to learn the now corrected sentences of exercise 2, to recite them in response to the reading of the English by the teacher. In learning these sentences the pupils should copy them as corrected into a permanent exercise book. The learning and memorizing of the corrected sentences is one of the most essential features of the lesson. Thus, in every second recitation there will come the correction of one English-German exercise and the recitation of the one preceding.

The most dispensable part of the recitation is the reciting of the words of the vocabulary. When a German song is to be learned and sung, as in lessons III, VII, and IX, the memorizing may be done in the second half of that lesson and the singing in the first half of the next lesson. The favorite songs should be sung frequently. There is no better means of rousing love for the language and fixing the vocabulary in the pupil's memory. Or the singing of the songs may take part of the period assigned to dictations.

**First Reading Lesson.** For the first reading lesson assign fourteen lines in Carruth's Reader. Read it over in German in assigning it. In recitation, have the pupil read the German sentence through first; correct him and have him read it again before translating. Translation should always be in good idiomatic English, and as nearly literal as this will permit. Do not permit a word-for-word translation except as necessary to explain a German idiom. By all means require translation. Reading without translation should not be encouraged the first year, unless it be with extra matter. Discourage marginal and interlinear notes.

**Exercises.** The exercises connected with the Reader may be taken up one at a time just after the reading of the corresponding section, or all those on a given extract may be taken in connected series, or they may be postponed until the completion of the work in the Reader. Whether the exercises are taken from the Reader or from Becker's Elements of German, they should be written and corrected and learned as prescribed for the exercises of the grammar. In the second term, however, the class may be occasionally tested for its ability to do an exercise orally without having written it previously. But, even then, the exercises should be written out afterwards. Writing makes an exact scholar. Neatness in writing should be insisted upon. Exercises should have wide spacing and ample margins, to make room for corrections.

**Dictations.** Dictations should consist of very simple German.

A sentence should be read through twice, once very slowly and then at normal rate, and the pupil should be expected to fix the sentence as thus read. If the sentence is complex, the teacher will have to repeat the clauses in order. Dictations should be handed in for inspection and correction. Occasionally the pupils should be required to read aloud from their own manuscripts.

Second Term.

DISTRIBUTION OF THE WORK.

Grammar (six lessons of Carruth's Otis, XIX to XXIV, including review).....	16 periods.
Reader (forty-eight to sixty pages, through <i>Der zerbrochene Krug</i> in Carruth's Reader).....	32 "
Exercises (completing XXXVI in Carruth's Reader)....	16 "
Dictations and songs.....	16 "
Review.....	5 "
Total.....	85 periods.

PROGRAM OF THE WORK.

Reader, two periods weekly, sixteen weeks.....	32 periods
Grammar, one period weekly, sixteen weeks.....	16 "
Exercises, one period weekly, sixteen weeks.....	16 "
Dictations and songs, one period weekly, sixteen weeks,	16 "
Review, one week solid .....	5 "
Total... ..	85 periods.

SECOND YEAR.

**Texts.** Carruth's Otis's Grammar; Carruth's Reader; Wilhelm Tell, Carruth's edition, Macmillan & Co., New York, or Palmer's edition, Holt & Co., New York, or Deering's edition, Heath & Co., Boston; for sight-reading: Hauff's *Der Zwerg Nase* (38 pp.), C. H. Kilborn, Boston, or Ebner-Eschenbach's *Krambambuli* (47 pp.), American Book Company, Chicago.

**Work to be Accomplished.** Review and completion of grammar; reading about 225 pages, with some composition exercises; practice in sight-reading.

DISTRIBUTION OF WORK.

Review of grammar (lessons II to XXIV).....	16 periods.
Completing grammar (lessons XXV to XXX).....	16 "
Completing reader, forty-five pages of prose and fifteen pages of verse, selected .....	32 "
Composition exercises on the same .....	16 "
Wilhelm Tell, complete, with review.....	64 "
Sight-reading.....	16 "
Final reviews.....	10 "
Total.....	170 periods.

## PROGRAM.

*First Term :*

Completion of grammar, one period daily for sixteen weeks.....	16 periods.
Completion of reader, three periods daily for eleven weeks, continuing with Wilhelm Tell, act I, five weeks.....	48   “
Composition exercises on reader, etc., one period daily for sixteen weeks.....	16   “
General review, one week solid.....	5   “
Total.....	85 periods.

*Second Term :*

Review of grammar, one period daily, sixteen weeks,	16 periods.
Completion of Wilhelm Tell, three periods daily for sixteen weeks.....	48   “
Sight-reading, one period daily for sixteen weeks....	16   “
General review, one week solid.....	5   “
Total.....	85 periods.

NOTE.—The Committee of Twelve recommends Wilhelm Tell for the intermediate course, or third year, of high-school work. For schools having a three-year course it may be well to follow this recommendation and occupy the reading time of the second year with easy prose like that found in the reader. But high schools having only two years of German should by all means not deprive their pupils of the delight of reading this play, which invariably appeals to them.

## THIRD YEAR.

**Texts.** Freytag's *Die Journalisten*, ed. Thomas, Holt & Co., ed. Toy, Heath & Co. (about 135 pages); Fouque's *Undine*, ed. v. Jagemann, Holt & Co. (about 115 pages); Heine's *Reisebilder*, ed. Van Daell, Heath & Co., ed. Burnett, Holt & Co., ed. Gregor, Ginn & Co. (about 90 pages); Riehl's *Burg Neideck*, ed. Wilson, Ginn & Co. (57 pages); Rosegger's *Waldschulmeister*, ed. Fossler, Holt & Co. (about 125 pages); Schiller's *Balladen*, ed. Johnson, Heath & Co. (about 90 pages). Out of these a good selection would be: Freytag's *Die Journalisten*, Schiller's *Balladen*, and any one of the other books listed. If one of the longer ones, a portion may be read at sight.

**Work to be Accomplished.** Reading and careful translation of about 300 pages of prose and verse, with composition and conversation exercises thereon, and drill in more difficult features of grammar as illustrated by the text.

**Distribution of Work.** A class should read from two to three pages daily, the lesser amount when more time is given to exercises on the text and to grammar review. Exceptional classes may be able to read 400 pages in the third year. In view of the minuteness with which programs for the earlier years have been given, it seems unnecessary to make such programs for the third year.

**FRENCH.** One, two or three units.

*First Unit.* The elements of grammar (Fraser and Squair's French Grammar), all of part I and the irregular verbs in part II; or Grandgent's Essentials of French Grammar, through the irregular verbs; or Van Daell's Introduction to the French Language, the first sixteen chapters.

Great stress should be laid on pronunciation, the quality of the vowels, syllabication. To fix these principles and connect sound with spelling, brief exercises in dictation, occupying only five or ten minutes, should be introduced after the first few weeks.

As the grammars named above all offer reading material, the reader proper need not be introduced before the seventh or eighth week, at first but one or two lessons a week, then with increasing frequency as the elementary facts of the language are mastered.

This reading should cover not less than 100 pages of simple French (as in Super's Reader), and should serve a threefold purpose: Translation into good English, practice in reading aloud of French, and illustration (and hence review) of the grammatical principles set out in the rules and applied in the written exercises.

*Second Unit.* Completion of all the lessons in the above-mentioned grammars, with suitable written exercises, at least once a week. In this manner the pupil will by the end of this period have mastered all the essentials of accidence and syntax. The reading should contribute to this end; in particular, the uses of modes and tenses should be repeatedly dwelt upon in connection with the reading.

More emphasis is now to be placed on dictation, and on the speaking by teacher and pupils of simple French sentences based on their reading, the teacher sometimes also reading aloud in French for translation by the pupils. The reading should comprise from 300 to 350 pages, which may be taken from the latter part of the reader and from such texts as Malot's *Sans Famille*, Daudet's *Selected Stories*, Erckmann-Chatrian's *Madame Therese*, Labiche's *le Voyage de M. Perrichon*, Sandeau's *Mademoiselle de la Seigliere*.

*Third Unit.* Thorough review of grammar. Composition once a week, both formal grammar exercises and résumés and paraphrases of short portions of French stories.

Suitable composition books are: Bouvet's French Syntax and Composition, and François's Advanced French Prose Composition.

Reading of 600 pages in such works as Mérimée's *Colomba*; A. France's *le Crime de Sylvestre Bonnard*; Pouvillon's *Petites Ames*; George Sand's *la Mare au diable*; Pailleron's *le Monde*

*ou l'on s'ennuie*; Loti's *Pêcheur d'Islande*; Theuriet's *Bigarreau*; Coppée's *le Pater*.

Teachers of French are advised to consult the valuable Report of the Committee of Twelve of the Modern Language Association of America.

### PHYSICS. One unit.

While successful teaching of physics requires both text-book and laboratory work, the latter is the more important and at the same time is more often neglected. The laboratory work and text-book work must each supplement the other. Without the actual performing of experiments the text-book is almost meaningless and soon forgotten.

In handling any text the teacher should feel free to omit any parts which, with the laboratory facilities at hand, cannot be made perfectly clear. In every good text are found sets of problems. If these are sufficiently simple they are of great use in affording an opportunity to apply and therefore fix in mind the principles learned. When the problems prove difficult it is likely not on account of any deficiency in the student's mathematical training. The terms used—ergs, dynes, kilograms, etc.—are confusingly new. The thing to do is to supply exceedingly simple problems till the student becomes familiar with the new units.

The second essential of a course in physics, the experimental part, includes, first, a set of thirty-five to fifty experiments to be performed by the student; and second, a number of demonstrative experiments performed by the teacher in connection with the lecture or recitation. Just what experiments should be performed by the students and what should be left for class-room demonstration is often a hard question to decide. The rule that demonstrative experiments be qualitative and students' experiments quantitative is good, but has many exceptions.

Experiments suitable for class-room demonstration are found in every text-book. For students' work, some such set of experiments as the following will be found useful:

1. Exercise in measuring lengths, areas, etc.
2. Measurement of volume by water displacement.
3. Laws of bending. Verify Hook's law for bending, stretching, etc.
4. Errors of spring balance. Find the corrections to be added to the readings of spring balances when used in a horizontal position.
5. Composition of forces. Find the resultant of two or more forces acting at the same point.
6. Parallel forces. Find the resultant of two parallel forces.

7. Simple pendulum. Find the effect of amplitude upon time of vibration.

8. Simple pendulum (continued). Find the law connecting length of pendulum and time of vibration.

9. Physical pendulum. Find the center of oscillation.

10. Levers. Find the law of equilibrium, the weight at fulcrum. (Compare with No. 6.)

11. Levers (continued). Find the center of gravity, and weight of a lever; also the mechanical advantage.

12. Inclined plane. Find the law of equilibrium of inclined plane, and the mechanical advantage.

13. Archimedes principle. Measure the lifting effect of a liquid on a body immersed in it, and also weight of the liquid displaced.

14. Density of solid. Find by weighing in water.

15. Density of a liquid. Two methods.

16. Law of flotation. Find weight of liquid displaced by a floating body and compare with weight of the body.

17. Vibration rate. Measure the vibration rate of a tuning-fork.

18. Wave length of sound. Measure the wave length of sound by use of the Y tubes and divided path.

19. Velocity of sound. Measure the velocity of sound.

20. Intensity of light. By the use of the photometer show that one candle gives the same illumination as four placed twice as far from a screen. Then, assuming the law of inverse squares, find the candle power of a lamp.

21. Plane mirror. Find the position of the image of a pin in a plane mirror.

22. Curved mirrors. Using a cylindrical mirror, find the position of the image of a pin formed by the central part of the mirror, then the image formed by the outer part of the mirror. (This will show spherical aberration.)

23. Index of refraction. Find the index of refraction of glass, using a piece of plate glass with two opposite edges ground.

24. Focal length of lens. Measure the focal length of a converging lens.

25. Images. Find the shape and size of real image formed by a lens; and compare with size of object, and distances of object and image from lens.

26. Virtual images. Study virtual images formed by lens, note where virtual images are located, and their position, whether inverted or erect; also determine whether or not the size of a virtual image, the size of the object, the distance of the image from the lens, and the distance of the object from the lens conforms to the same law as was found to hold for real images.

27. Fixed points of a thermometer. Find the freezing-point and the boiling-point and compare with those on the scale.

28. Coefficient of linear expansion of a solid. Measure the linear expansion of a solid and compute the coefficient.

29. Coefficient of cubical expansion of a liquid. Measure the expansion of turpentine or alcohol and compute the coefficient of cubical expansion.

30. Coefficient of cubical expansion of a gas. Measure similar to 29. Also verify Charles law.

31. Specific heat. Measure the specific heat of some solid.

32. Latent heat of fusion. Measure the heat of fusion of ice.

33. Heat of vaporization. Measure the heat of vaporization of water by condensing steam.

34. Dew-point. Find the dew-point.

35. Lines of force. Study and map on paper the lines of force in the field of a magnet. Trace also the effect (on those lines) of soft iron brought into the field.

36. Simple voltaic cell. Set up simple cell and observe local action. Amalgamate the zincs. Connect up again through a galvanometer, electric bell, or telegraph sounder, and leave till polarized.

37. Preventing polarization. Show the following ways of overcoming polarization: (*a*) Two fluid methods, first, by depositing copper instead of hydrogen, second, by oxidation of hydrogen; (*b*) single fluid oxidation of hydrogen by the use potassium bichromate, etc.; (*c*) show oxidation by use of solids, as manganese dioxide, etc.

38. Electric resistance of conductor. By the method of substitution measure resistances; find the effect of varying, first, the length, and second, the cross-section, of the conductor.

39. Wheatstone bridge. Measure resistances by use of the Wheatstone bridge.

40. Temperature coefficient. With the Wheatstone bridge, measure the resistance of a copper wire at different temperatures and compute the temperature coefficient.

Probably the most difficult task that confronts the physics teacher in the small high school is to start the equipment of a laboratory on small means. The first maxim is, buy for use and not for show. Buy the less expensive first. Get the necessities before the luxuries. Do not begin by the purchase of Geisler tubes and X-ray apparatus.

In offering suggestions in regard to the equipment of a laboratory, let us begin with the room itself. This should be dry, well lighted, and, if possible, with south exposure. Never use a basement room.

The room should be provided with heavy, flat-topped tables, about thirty-two inches high. The length and breadth of these must often be adapted to the shape of the room, but, when possible,

tables three feet wide and eight feet long will be found very convenient. These tables should have no iron in their construction, and the top should project at least three inches. Any good carpenter can make these tables.

If there is a good water system in the building the laboratory should be provided with a sink. If not, a wooden tank a foot deep, two feet wide, and three feet long, lined with zinc or galvanized iron will be found convenient. If the laboratory can be supplied with gas, the fixtures should hang from the ceiling directly over the tables and about four feet above them. Connections can then be made with Bunsen burners by the use of rubber tubing. If no gas can be provided, gasoline torches handled with care are the best substitute.

Cases for storing apparatus should be about fourteen inches deep, with movable shelves and glass fronts. They should be self-locking, and all open with the same key. A class in physics consumes at best more of the teacher's time than one in most other branches. Everything about the laboratory should be arranged to facilitate the getting out and putting away of apparatus. Then the teacher should be expected and required to see that all tools and apparatus be locked up when not in use.

A few tools for making and repairing apparatus are an essential part of a laboratory equipment. There should be a small carpenter's work-bench, and at least the following tools: Vise, fine-toothed saw, small plane, brace, drills, screw-driver, pliers, files, small claw-hammer, tinner's snips, small soldering-iron, hack-saw.

The following apparatus, together with what can be made by the teacher and pupils, will enable a class of twelve to perform in a fairly satisfactory manner all of the forty experiments of the above list:

- |  |  |
|--|--|
| 6 metric rulers, 30 cm. long.                                  | 3 pounds glass tubing, assorted sizes.             |
| 2 meter sticks.  | 4 lead Y tubes.                                    |
| 1 vernier caliper reading to tenths of a millimeter.           | 16 feet rubber tubing one-half inch in diameter.   |
| 2 specific-gravity balances.                                   | 6 plane mirrors, 3x4 inches.                       |
| 2 sets weights from .01 g. to 500 g.                           | 2 cylindrical mirrors.                             |
| 6 spring balances, 250 g. in 10 g. divisions.                  | 6 plate-glass squares, two opposite edges ground.  |
| 2 graduate cylinders 100 cubic centimeters.                    | 6 condensing lenses, different focal lengths.      |
| 1 pound bullets.   | • 1 set of 6 demonstration lenses.                 |
| Spool cotton thread.   | 6 chemical thermometers.                           |
| 4 tuning-forks.  | 2 linear-expansion apparatus.                      |
| 2 apparatus for recording the vibration rate of a tuning-fork. | 30 feet rubber tubing three-eighths-inch diameter. |
| 2 bass-viol bows.  | 6 Bunsen burners or 2 gasoline torches.            |
| 2 pieces brass tubing 1 inch in diameter and 3 feet long.      | 6 flat-bottomed flasks, 500 cubic centimeters.     |

2 square feet wire gauze.  
 6 ring stands, 3 rings each.  
 6 glass funnels.  
 6 calorimeters, thin brass, nickel plated, 3 x 5 inches.  
 4 bar magnets, 6 inch.  
 2 horseshoe magnets, 6 inch.  
 2 pounds iron filings.  
 6 glass tumblers.  
 1 square foot sheet copper.  
 6 battery zincs.  
 2 pounds mercury.

2 pounds sulphuric acid.  
 $\frac{1}{4}$  pound potassium bichromate.  
 1 pound manganese dioxide.  
 2 resistance boxes.  
 2 Wheatstone bridges.  
 4 Daniell cells, complete.  
 1 pound copper wire, 20 gauge.  
 $\frac{1}{4}$  pound resistance wire, 30 gauge.  
 2 temperature coils.  
 6 small magnetic compasses.  
 2 tangent galvanometers.

The cost of the above apparatus should be about \$130. Much additional apparatus will be needed for lecture demonstration. The teacher who has a small amount of money to expend will find it possible to get along with half of the above apparatus, cutting the numbers in two.

For demonstrative work, the following list includes most of the apparatus which is absolutely essential:

1 pint alcohol.  
 Glass-cutter.  
 $\frac{1}{4}$  pound alum.  
 1 dozen test-tubes.  
 1 bottle household ammonia.  
 Thistle-tube.  
 1 ounce camphor gum.  
 1 pound salt.  
 Set of pulleys.  
 Small air-pump.  
 Whirling machine.  
 Harness-maker's punch.  
 $\frac{1}{4}$  pound piano wire.  
 4 guitar strings.  
 6 feet glass tubing 1 inch in diameter.  
 6 sheets white cardboard.  
 1 crown-glass prism.  
 1 flint-glass prism.  
 1 spherical mirror, concave on one side, convex on the other.  
 3 dozen large corks, assorted.

1 set colored-glass plates.  
 Colored paper.  
 $\frac{1}{4}$  pound ammonium nitrate.  
 $\frac{1}{4}$  pound sodium sulphate.  
 2 ounces ether.  
 1 air thermometer.  
 2 wide-mouthed bottles.  
 1 pound paraffin.  
 1 set knitting-needles.  
 6 broken watch-springs.  
 1 dozen pith-balls.  
 1 stick sealing-wax.  
 Piece flannel cloth.  
 Piece silk cloth.  
 1 electroscope.  
 1 telegraph sounder.  
 1 telephone receiver.  
 1 telephone transmitter.  
 4 dry batteries.  
 1 small electric motor.  
 1 induction coil.

This will enable the teacher to perform about three-fourths of the experiments given in Carhart and Chute's High-school Physics. Its cost, together with half of the apparatus of the previous list, will be about \$100.

The following valuable advice for laboratory management is taken from Chute's Laboratory Manual: "There are in use two methods of conducting laboratory work, the *separate* system and the *collective* system. Under the former the students work on different problems, the apparatus going around in rotation. It is difficult under this plan to have the students' work conform to a strictly

logical order, but on the other hand it requires little or no duplication of apparatus. The collective system is the ideal one. Under it all are engaged on the same kind of work at the same time. It has this advantage over the separate system, a teacher can instruct all at once on any point demanding more than ordinary care and can give more attention to the few who may be less apt in their work. A combination of the two is probably the best for most schools, in that it avoids the duplication of expensive pieces of apparatus and permits it in the case of the less costly."

A small library, such as the following, will be very helpful:

Laboratory Manual of Physics, Chester-Dean-Timmerman, American Book Company.

Physical-laboratory Manual, S. E. Coleman, D. Appleton & Co.

Manual of Experimental Physics, Nichols, Smith, and Turton, Ginn & Co.

High-school Physics, edition of 1902, Carhart and Chute, Allyn & Bacon.

A Text-book of Physics, W. Watson, Longmans & Co.

A History of Physics, F. Cajori, The Macmillan Company.

Smithsonian Physical Tables, prepared by Thomas Gray, published by the Smithsonian Institution, Washington, D. C.

Scientific American Supplement.

### **CHEMISTRY.** One unit.

In order that chemistry should be successfully taught, the following conditions are necessary:

I.—A teacher who is enthusiastic and interested in the subject.

II.—A teacher who knows more than he attempts to teach.

III.—Sufficient laboratory facilities, so that one half the time may be advantageously spent in laboratory work.

IV.—An abundance of laboratory apparatus, so that each student may do the experiments for himself, and not be obliged to gain his knowledge by seeing them performed by some one else.

V.—A text-book sufficiently complete and modern to be of assistance to the student and the teacher.

We are perfectly aware that the above conditions may seem ideal and almost impossible of attainment in the ordinary high school, but the nearer we can come to reaching them the more satisfactory will be the work. It is true that there are only a few schools in which a teacher can devote his whole time to chemistry, and there are many schools where he is expected to teach chemistry, physics, and, perhaps, the biological sciences. Unfortunately, since there are some schools where chemistry is simply one of the sciences which an instructor is required to teach, and since, in addition, he must carry

some Latin and German "on the side," it would be better for the preparation of the student and the reputation of the school if no attempt were made to teach chemistry. If such studies as cannot be carried satisfactorily are entirely omitted from the list of subjects offered, the energy of the teaching force can be concentrated on language, mathematics, history, and physics, and better work will be the result. One reason for this suggestion is, that such subjects can be taught without much expense for illustrative material.

It goes without saying that interest in his subject and enthusiasm go very far towards making the successful teacher. But this is no more true in chemistry than in any other subject. It is too much to ask that a teacher should be equally enthusiastic in each one of a half-dozen unrelated subjects. The time has gone by when any natural science can be taught by the use of a text-book alone. The methods in use fifty years ago will not give the instruction that our progress demands. The laboratory in a high school need not be very expensive, but it should be roomy, well lighted, and well ventilated. It is most earnestly to be hoped that no more high-school buildings in this state will be arranged with the chemical and physical laboratories in the basement, for under these conditions the air of the whole building is vitiated and the opportunities for ventilation are very much curtailed. If the top floor or the attic of the building be utilized for a chemical laboratory, flues can be arranged with but little expense to connect with hoods, so that poisonous and disagreeable fumes may be immediately carried out of the building. The expense of fitting up a laboratory is very much decreased if the class is divided into several divisions for the laboratory work, as the same tables and apparatus can be used by the different divisions. If the laboratory is not supplied with sufficient material, or there are not enough desks, so that each student can perform the work by himself, there is very little profit derived from the experiments. If two, three or four attempt to perform an experiment at the same time with the same apparatus, one does the work and gets the experience while the others look on—a part of the time—and receive absolutely no benefit. In order to save time, it will be found of great advantage to have at least two hours of consecutive work in the laboratory. With forty-minute periods, as the schedule is arranged in some schools, fully a third of the time is spent in getting ready for work and in putting away the apparatus at the close of the exercise.

The high schools of the state have labored under considerable disadvantage for the past five years on account of the elementary and unsatisfactory character of the text-book adopted in chemistry. It is hoped that with an unabridged edition of the new text-book that has been adopted, and with the laboratory manual which is in-

cluded, much more satisfactory work will be possible. Students who complete two terms in chemistry with sufficient laboratory work can use this for entrance credit to the University. If students do not care to use it in this way, and wish advanced credit in the University, they must pass an examination at the stated times noted in the catalogue. A half-year of chemistry in the high school will not be accepted for entrance credit.

For the engineering courses, it is of great importance that the preparatory work in chemistry be thorough and complete, as this work is followed in the sophomore year by a term of Ostwald's Principles of Inorganic Chemistry and by a term of qualitative analysis, and these studies cannot be successfully carried on without a thorough foundation of general chemistry. The same remark as to thoroughness necessary applies to those students in the College of Liberal Arts and Sciences who propose to specialize in physical science. Since there are many high schools in which chemistry is not offered in preparation for the University, an opportunity is given the student either in the first or second term at the University to make up that subject.

For the benefit of teachers who propose to fit out a laboratory for chemical work, the following list of apparatus is suggested; this is practically what will be needed by one student:

Beakers, nest, 100-700 cc.	Iron stand with clamp.
Bunsen burner or alcohol lamp.	Mortar, porcelain (100 mm.)
Blowpipe, 10 inch.	Retorts, 1 (250 cc.)
Corks, 2 dozen assorted.	Rubber tubing, 3 feet, for burner.
Deflagrating spoon.	Rubber tubing, 2 feet, for connections.
Evaporating dishes, 2 (75-100 mm.)	Safety-tube.
File, round.	Test-tubes, 12.
File, triangular.	Test-tube stand.
Flasks, Florence, 4.	Thistle-tube.
Flask, Wolf, 1 (300 cc.)	Tripod.
Funnels, 2.	U tubes, 2.
Gauze, wire, 6 x 6.	Watch-glasses, 2.
Glass tubing, soft.	Wire, 1 foot mg.
Glass rod, 1 ounce.	

This will cost about \$8.50.

The following apparatus will serve without duplication for a small class:

Burette, Mohr, grad. to $\frac{1}{10}$ cc., 50 cc., complete.	Magnet, 4-inch horseshoe.
Cells, Bunsen, 2.	Measuring-glass, 4 ounce.
Cork borers, set of 6.	Punch-cock, Hoffman, medium.
Condenser and tubing.	Scales, set.
Gas-measuring tube, grad. to $\frac{1}{2}$ cc., 25 cc.	Weights, set.

This will cost about \$10.

A list of chemicals needed for the work can readily be made out

by the instructor. The actual cost to each student, when a considerable quantity is bought at one time, need not be more than \$2 or \$3.

Apparatus and chemicals can be purchased of Eimer & Amend, 205 Third avenue, New York; of the Henry Heil Chemical Company, St. Louis; of the Chicago Laboratory Supply Company, Chicago. A discount of from ten to twenty per cent. will usually be allowed the purchaser when considerable material is bought.

The chemistry department will gladly answer any inquiries from teachers or boards of education in regard to the work, and will consider it a favor if those who have it in charge will keep in close touch with the University.

### **BOTANY. One unit.**

**The Function of Botanical Instruction.** In common with other studies, botany affords training in observation and reasoning, and in planning the course this must be kept sight of in method and matter; and it is the function of an elementary course of botany also to give an exact knowledge of the most important facts about the nature of plants. The very fact that we are absolutely dependent on plants for our existence, and that they strongly influence our lives in many ways, establishes for botany a natural place in the list of the most important studies offered in the secondary schools. It should be the aim of botanical instruction in these schools not to make botanists, but to disseminate knowledge of how plants are constructed, how they get their living, how they react to their environment in a way helpful to them, what their place in nature is, and how they help us, and how we may help them. The story of plants has an esthetic and a practical side. Almost any fundamental fact about plants bears on both sides; it enhances our appreciation of plants, and helps us to deal with them more intelligently. This, in a word, it is the part of botanical instruction in the secondary schools to accomplish.

**The Method.** Primarily the plants themselves are to be studied, and only secondarily what somebody says about them. The study is to be exact, detailed, and thoughtful; not hurried, cursory, and without satisfying application and conclusion. The problem of supplying materials for a year's course is simple enough if the work is thoroughly done; but if the pupils are allowed to skip hurriedly from subject to subject, the materials for a year's course will have been gone over in a month, the pupils will have acquired no good in training or knowledge, and the teacher will complain that it is impossible to offer a year's course in the secondary schools. To insure the right sort of work the pupils are to make neat and exact draw-

ings and intelligent notes for each subject worked out in the laboratory. The drawings are to be made with a hard drawing-pencil (6-H Koh-I-Noor is the most satisfactory), on heavy, unruled linen ledger paper. The notes, written in ink, are to face the drawings, so that drawings and notes can be compared without turning the page. The notes should be on separate sheets, and not on the backs of the drawings. Both drawings and notes are to be placed symmetrically on the pages. Before beginning a page of drawings it is to be determined how many are to go on that page and where they are to be placed, so that when the pages are completed they will be pleasing in their symmetry. The drawings are to be simple outlines, done with care, so that they are distinct, neat, and in right proportion. When the pages are done, drawings and notes, they are to show intelligently and truthfully what the pupil should learn from his subject, and they should be pleasing to look at. Inexact and sloven work is an abomination, and worse than nothing. To let such work pass is to do the pupil an injury. Why require drawings when so much time is consumed in their making? Because they are the most exact and simplest mode of expression in the study of form and structure. Pupils who think they cannot draw can yet express themselves about form and structure better in that way than in spoken or written language. Again, when drawings are to be made, the pupil becomes a more exact observer. The notes are to tell what the parts of the drawings are, how the materials are prepared for study, and what facts of plant life, structural, physiological, or ecological, have been learned. They should show that the pupil has been thinking about his work and sees its meaning. To insure that all this be well done the laboratory book must be gone over by the teacher at frequent intervals, and its defects discussed with the pupil, and the necessary improvement insisted on before a passing grade is obtained. In being thus guided with a firm hand the pupils are apt to like their work better and are sure to respect it.

Wherever possible, physiological experiments should accompany the laboratory work on form and structure. These may be prepared by the teacher, or they may be assigned to groups of pupils for demonstration before the entire class. Directions for such experiments will be found in some of the books cited below. Form and structure dissociated from physiological function or adaptation to the outer world are the mere husks of botany, and as soon as learned they are to be followed by an inquiry into their reason for being. Studied in this way botany is a subject of intense interest to any one who wants to know what and how God hath wrought. Happily physiological experimentation is within the possibilities

of any school, for the necessary apparatus is simple and can be arranged by teacher or pupils.

Field excursions are a good thing. The teacher should take out not more than eight or ten pupils at a time. He should go over the ground beforehand and become familiar with the problems that can be worked out in the locality to be visited. In the laboratory, form, structure and function are learned to best advantage, and in the field, adaptation to the outer world, and distribution. Therefore field-work becomes necessary to a properly rounded course. But it should be genuine and definite work, and not a merely pleasurable excursion. To insure successful field-work the teacher must be familiar with the ground to be traversed, must have put definite problems before the pupils, with a plan for their execution, and must have only a small group of pupils to supervise.

The time devoted to botany, including laboratory work, recitations, and discussions, but not preparation for recitations, should be not less than five hours per week. Where the periods are less than one hour, as in most instances, the pupils should be required to complete the time at other hours. This is justifiable, since the preparation for recitations does not require as much time as other studies, two recitations per week being all that would be necessary.

**Equipment.** The first requisite is a well-prepared and enthusiastic teacher. When a teacher with little or no preparation is made to teach botany as a side issue it is injustice to the teacher, the pupils, and the subject. It were far better not to offer the subject at all under such conditions. It may be stated as a general rule that to be well prepared the teacher should have worked through the equivalent of the botany courses I to V, inclusive, in the University catalogue for 1903-'04, namely, courses in elementary structural botany, plant histology, cryptogamic botany, experimental plant physiology, and systematic botany. With such preparation the right sort of a teacher is bound to make a success of his course, no matter how poor the laboratory equipment may be. But a good laboratory equipment is a great help, and so inexpensive that no school need be without it. There should be flat-topped tables, about thirty inches high, affording elbow room for each pupil, placed before windows so as to get plenty of light. Each pupil is to have a good magnifier mounted on a block, so as to leave both hands free for the use of dissecting needles. The doublet magnifiers of three-fourths-inch focus manufactured by Bausch & Lomb, Rochester, N. Y., or by the Spencer Lens Company, Buffalo, N. Y., are satisfactory. The blocks may be made as described in Stevens's *Introduction to Botany*, page 371. The Barnes dissecting microscopes made by Bausch & Lomb, and listed at \$2.50, but subject

to discount, will answer every purpose. Each pupil is to have two dissecting needles, easily made by thrusting strong needles into soft wood handles, and a sharp pocketknife. This completes the apparatus needed by each pupil. The laboratory should have at least one compound microscope for the demonstration of minute anatomy. More of these, if it can be afforded, would be highly desirable. The Bausch and Lomb BB4 special, and the Spencer No. 50 E, compound-microscope outfits, sold to schools at approximately thirty-five dollars, fill all requirements. There are cheaper outfits supplied by these companies and other dealers. Even the cheapest outfits of the Bausch & Lomb and Spencer companies, catalogued as A1 and 80A, respectively, costing schools approximately ten dollars, would prove very useful. The laboratory should own a Spencer table microtome for hand-sectioning and a sectioning razor, together costing schools ten dollars. Information about the necessary stains, reagents, etc., will be found in some of the books cited below. If the school can afford it, the laboratory could be more completely equipped as advised in Ganong's *Teaching Botanist*, mentioned in the book list below.

In carrying out a course logical in sequence, such as that outlined below, some facilities for preparing materials must be provided. First of all there should be a room, or part of a room, kept warm enough for germinating seeds successfully, provided with rough boxes filled with white pine sawdust for seed-beds, and jars holding water in which branches of woody plants can be forced into leaf and blossom when needed. Some schools use successfully the basement furnace-room for this purpose, and any basement room will do that can be kept warm enough. Then there should be a cupboard in which seeds and fruits gathered during the summer to illustrate dissemination can be stored in boxes away from the mice, and in which Mason jars containing two per cent. formalin, or equal parts of alcohol, glycerine, and water, for preserving flowers and part of plants for sectioning, can be kept handy and safe from breakage. A general might as well attempt a campaign without ammunition as a teacher a course in botany without having planned to supply the necessary materials for study in abundance, at the right time, and in suitable condition. Directions for providing materials will be found in detail in Ganong's *Teaching Botanist* and Stevens's *Introduction to Botany*.

**The Course.** In planning the course two questions chiefly must be considered: What subjects will give the best enlightenment about plants in the brief time of an elementary course? And what materials is it practicable for the secondary schools to provide for laboratory study in abundance throughout the school year? Hap-

pily these are not conflicting problems. Their solution is found in the following sequence of subjects:

1. *Seeds and Seedlings.* Study Lima bean, castor-bean, and Indian corn, dry, soaked, and in different stages of germination. A seed is a plant in its simplest terms and affords a logical beginning. The pupil is to learn what a seed is, what its purpose is, what its different parts are for, and how they perform their functions during the resting period of the seed and during germination.

In the food stored in seeds he learns what sorts of materials constitute the real food of plants. In watching what becomes of this food during germination he learns about digestion and the assimilation of food into new plant substance. By simple experiments with germinating seeds he learns the conditions necessary to growth, and about respiration. In watching the parts of the seedling find their wonted directions of growth, no matter in what positions the seeds lie, and with simple experiments to bring out further information, he learns that plants are sensible to outer influences, and respond in a way to accomplish for themselves the most good. By comparing the different types of seeds and their variations of habit in germination he learns how plants of different kinds work out the problems of their existence in ways dissimilar in detail but alike in general result. With this much accomplished the pupil has made a good beginning in method, knowledge, and awakened interest.

2. *Roots.* Study the definite order of outgrowth of lateral roots from the main root of seedlings, and the indefinite order of succeeding rootlets. Study root-hairs on seedlings grown on moist blotting-paper or in any suitable moist chamber. Demonstrate with a compound microscope the cellular structure of roots in cross and longitudinal sections, calling particular attention to the tracheal tubes through which the water rises in the plant. Demonstrate the rise of water by osmosis in an artificial apparatus. Demonstrate the attraction of roots by moisture. The pupil is to learn the function of roots in fixation, absorption, and conduction; the nature of root-hairs, and how admirably they are adapted to fit into the small interstices of the soil and put themselves in close contact with its finest particles, so as to absorb the films of water about them and the minerals in solution. He is to learn here what the plasmatic membrane is and how it keeps the important substances of the cell sap from becoming lost into the soil while permitting the entrance of water and dissolved substances. He is to study the formation of adventitious roots in cuttings, and their value in the propagation of plants. He is to learn about roots used for storage, the roots of parasites, as in dodder, and the roots of air plants. He is to learn about the

nature of the soil, and the great extent and depth which some roots have.

3. *Buds and Stems.* Study young branches with buds in their winter condition, of horse-chestnut, cottonwood, and lilac. Horse-chestnut is particularly fine; but if it cannot be obtained, hickory may take its place. Study these buds in various stages of unfolding, having forced their growth in jars of water in a warm room. Study leaves in embryo in the bud, and note their behavior as they grow to maturity, and try to find good reasons for everything observed. Study position of leaves on the stem, and their relation to lateral buds, and the age of the stem on which they are found. Demonstrate the cellular anatomy of stems in cross- and longitudinal sections. Learn the functions of the different zones of tissues in bark and wood. Learn the nature of a ring of growth and the purpose of its two zones of early and late growth. Examine the cellular structure of the stem of a monocotyledonous plant, such as corn. Study experiments to show the rise of water through the wood and the circulation of elaborated food through the inner bark. Study the use of buds and cuttings in plant propagation. Proceeding in this order, the pupil learns the nature of a shoot (stem and leaves) in its embryonic condition in the bud, and how the favorable conditions of spring are quickly used to advantage by having the parts which are to grow forth already formed in miniature the previous season. He learns the admirable plan of packing these parts away within the small compass of a bud, and protecting them by means of scales, hairs, resinous substances, etc. He learns that there is a double highway for the conduction of materials in plants, and he should think this over and find the wisdom in it. The "ring of growth" is no longer a mere phrase, but answers a physiological necessity. He learns that the qualities of a plant may reside in every small part of it, so that a single bud can transmit faithfully all that a plant is, and so be one of the most important means of propagation; and he should see how the habits and mode of life of plants demand this. By a comparison of the cellular anatomy of dicotyledonous and monocotyledonous stems he learns how plants have solved the problem of increase in diameter and provision for strength and the transportation of materials after two distinct plans; to best advantage, however, evidently in the dicotyledonous plan, since a vastly greater variety of such plants have succeeded as trees.

4. *Leaves.* Study leaves of different shapes and sizes, and, wherever possible, see how form, size, angular divergence and vertical distances apart are correlated with the size and habit of the plant and the place in which it grows. Study the positions which leaves take with reference to the incident light, including such a

variety of positions as shown by the elm, maple, cottonwood, Solomon's seal, grasses, and compass plants. Determine whether these different positions are equally advantageous, and whether there is not an ideal position that would serve best in all cases. Determine by experiment what light has to do with the directions which leaves assume. Study the cellular anatomy of a leaf; the epidermis with its stomata and its imperviousness to water; the palisade and spongy parenchyma with their chloroplasts, the intercellular spaces, and the vascular bundles or veins. Compare the starch content of leaves that have been kept in the dark with that of those which have been kept in the light. Study the starch content of leaves that have been kept in the light in an atmosphere devoid of carbon dioxide, and of leaves kept in the light with stomata artificially closed. Confine leaves under glass jars and study the effect on the oxygen and carbon-dioxide content of the jars when kept in the light, and again in the dark. Demonstrate the transpiration of water by the leaves. Compare leaves of ordinary land plants, desert plants, and water plants, and determine the reasons for their chief differences. The pupil learns that the leaf is the part of the plant which has the manufacture of the plant's food as its chief function. He learns how carbon dioxide is used in this process, and the fact that the sunlight supplies the necessary energy; he learns that leaves breathe (it is not implied that the other parts of plants do not breathe, for they do), and that the water absorbed by the roots is given off by them. He understands, when he compares the cellular anatomy with the particular function of each part, the wonderful structural adaptation to the energy and materials to be used and the work to be done. He learns that leaves are able to perceive the direction of the source of light and to respond to it in a useful way. In studying the different kinds of leaves he perceives the fact of great variability, one of the most important facts in nature. In comparing the leaves of ordinary land plants, desert plants, and water plants, he learns of the power of plants to modify the forms and character of their members in a way that is directly adaptive to their environment, another of the most important facts in nature.

5. *Growth and Movement.* With a compound microscope demonstrate the embryonic condition of the cells at the apex of an onion root, and show how these become changed into permanent tissues of the bark and wood farther back in the older portions of the root. Learn the processes of nuclear and cell division and the evident significance of the great care taken. Demonstrate regions of continued growth in dicotyledonous plants and grasses. Demonstrate the effect of different intensities of light on growth. Determine the relation of the cambium ring to the additions to wood and bark.

Study under different conditions the behavior of the leaves of sensitive-plant seedlings grown under bell jars ventilated at the bottom. Study the behavior of twining plants and sensitive tendrils. Read about other cases of sensitiveness in plants. It will be noted that most of this work consists of demonstrations before the entire class. While the subject of growth and movement as here outlined does not consume much time it is yet one of the most important in plant study. The pupil is introduced to the wonderful facts of cell multiplication, and differentiation from a common origin into various forms to meet different functions. He will find it interesting and instructive to speculate why plants continue to increase in size just where they do and not otherwheres. He has learned more about the sensitiveness of plants to the outer world, and their ability to respond to their perceptions in a useful way. He is now prepared to see that plants are endowed with something little short of intelligence.

6. *Modified Parts.* Study roots, stems, and leaves that have been modified so as to perform other than their usual functions; thus, the thorns of wild crab, hedge, and honey-locust; sweet and Irish potatoes; the onion; the tendrils of wild smilax and garden pea; all of the vegetative parts of greenhouse smilax and garden asparagus. Here the pupil learns more about the plasticity of plants in molding the forms of their members to meet specific requirements, and the capacity of plants to vary for known or unknown reasons, and he is in a position to understand better how the great diversity of plant forms has come about. In applying the lines of evidence which he must follow in determining whether unusual forms are roots, stems, leaves, or something else, he is getting good training in careful observation and logical conclusion.

The work thus far outlined, done with the care suggested under "Method," begun at the opening of school in the fall, will not be completed long before the flowers of early spring appear. We are now ready to take up the study of flowers, and the gap can be supplied with flowers that hold their form well in formalin, such as the yucca, asclepias, trumpet-creeper, and Compositæ of the sunflower sorts. It will be noted that the material needed for the course up to this point is such as can be provided right along through the winter with the most ordinary facilities.

7. *Flowers.* Study first flowers of simple construction, such as the yucca, dog's-tooth violet, anemone, and shepherd's purse. Then select flowers of more complex construction which have been adapted to protect pollen and nectar and to assist in cross-pollination, such as asclepias, larkspur, iris, and violet. Then study several species of a genus, several genera of a family, and typical species of closely allied

families, to bring out the evidences of relationship and the grounds for classification. The object is not to work over as many flowers as possible, but to select a few with a definite purpose in each case. The teacher should see that the leading questions properly pertaining to each flower selected have been asked and answered. The teacher will find many useful suggestions in Müller's *Fertilization of Flowers*, and Kerner and Oliver's *Natural History of Plants*. With diagrams make clear the processes of fertilization and the results. Discuss the benefits of cross-fertilization, and in this light interpret the frequent elaborate devices to secure it. Besides the drawings of dissections, have the pupils make cross- and longitudinal diagrams of the flowers to bring out the main structural facts clearly. Go over the evidence about the evolution of a flower from its simpler representatives in the lower plants. The pupil learns what a flower is and how its different parts are adapted to their functions. He learns the wonderful relation of insects to flowers, and how many flowers have adapted themselves to this relationship by modifications of form, etc. And so the evidence is accumulating for him that plants are not cast in rigid molds, but are responsive and adaptive to various influences of the outer world. He learns that there is a real blood relationship between plants differing in general appearance, and that, although there is no written book of lineage for them, the evidence of relationship is by no means obscure and furnishes the ground for classification. He learns the essential facts about sex, the same in plants as in animals, and the use of sex differences in bringing about a more vigorous offspring, and as a means of variation. With this knowledge he has a foundation for an understanding of scientific plant-breeding, which is now being perfected in the experimental stations and is proving of untold advantage to agriculture. Thus his appreciation of flowers is definite and increased many fold.

8. *Distribution of Fruits and Seeds.* Study special devices for scattering seeds, by means of the elastic action of carpels and ways of that kind, or by outgrowths from the seeds themselves in the form of hooks, hairs, or wings. Study fruits that have devices to aid distribution, such as fleshy and nut-like fruits, and fruits with hooks, parachutes, and wings, etc. Determine in each case what part of the seed or fruit furnishes the device. For this work material must have been put up in formalin or dry in boxes the previous summer or fall. The pupil learns the efforts which plants have themselves made to secure dissemination. He learns that they have been able to attain the same end in a great variety of ways; that they have modified various of their own parts, and pressed into service different kinds of outside agents. The evidence of the completeness of the ad-

justment of plants to their environment has been accumulating before the pupil throughout the entire course.

9. *Algæ, Fungi, Mosses, Ferns.* The work in these subjects cannot be so thorough as in the previous ones, because the time will not permit, and the equipment in compound microscopes will in all probability not be sufficient. But the pupil must not leave the subject of botany without some exact knowledge of these lower plants. Study with the naked eye, simple magnifiers, and as much as possible with a compound microscope, algæ growing in ponds, watering-troughs, etc., and on the north sides of trees; bread mold, wheat rust, and toadstools; mosses bearing capsules; ferns with sporangia, and their prothallia. Even with this cursory study a great deal will be cleared up that before was obscure to the pupil. In the study of the algæ the pupil learns by what simple forms an independent existence can be carried on, and he sees in them the possibly very early progenitors of the highest forms of the present day. He learns about the simplest mode of multiplication by the division of a parent cell, and possibly his material will show the formation of spores. In the fungi he learns about the peculiar habit of parasitism or saprophytism. He sees in them the apparently degenerate descendants of the algæ that have lost their chlorophyll and consequently their independence, or it may be that they gave up their independence and lost their chlorophyll as a penalty. He learns that these forms of life cause the destruction of organic substances, and disease in living organisms. In the study of fungi the bacteria and their activities may have also been considered. In the study of mosses he sees the first efforts at the differentiation of the plant body into roots and leaf-bearing stems, but with true roots not yet evolved. He sees the very simplest forms of leaves, which are, nevertheless, efficient food-makers. In the ferns the pupil finds a more successful attempt to differentiate the plant body into roots, stems, and leaves. He sees a clear case of the wonderful habit of alternation of generations, which is present but obscure in the mosses, and present and still more obscure in the higher plants. The teacher will use his own judgment about attempting to relate the story of alternation of generations and its apparent significance in the study of evolution. It is one of the wonderful things about plant life, and of great use as evidence of relationship between the lower and higher forms. But it is an unusually difficult subject, and unless thoroughly exploited is apt to lead only to confusion. Still, it would seem too bad to pass so close to a wonderful fact and leave it untouched.

This will end the year's course. It will be seen that it is full of hard work and requires a wide-awake mind. But we expect this of any study that is worth while. Having gone through it thoroughly

the pupil's horizon will have been immensely broadened and his interest in the world about him enhanced.

There seems to be the absurdity abroad, even among some school-teachers, that the study of botany in the high schools should be made easy—a sort of gentle wafting of the pupils on beds of roses into a more or less sentimental appreciation of form, color and fragrance, and the like. It seems to be a product of the fairy-tale sort of nature study which gives a cheap representation of what, as it stands uncolored, is already marvelous beyond conception.

It is this fictitious sort of botany, without any care for the exact truth, and without purpose or logical sequence in its methods, and unexacting of those who study it, that has brought the real science into disrepute amongst serious people, and kept it from taking its rightful place by the side of language and mathematics, as affording the right sort of training and a worthy body of knowledge.

10. *Helpful Books.* There is one book that stands preeminent in its helpfulness to teachers. The Teaching Botanist, by William F. Ganong, published by the Macmillan Company, New York. In it a sufficiently complete list of botanical books will be found. Some other books should be mentioned here. Müller's Fertilization of Flowers, the Macmillan Company, is an indispensable help in the study of flowers. Kerner and Oliver's Natural History of Plants, Henry Holt & Co., N. Y., is replete with information about all phases of plant study; this should be in every school library. Geddes's Chapters in Modern Botany, Charles Scribner's Sons, N. Y., is a series of very interesting essays in the modern scientific spirit. Barnes's Plant Life, Henry Holt & Co., is a clear and logical presentation of the subject from the standpoint of the relation of form to function. A Text-book of Botany, by Strasburger Noll, Schenck, and Schimper, is written by specialists in its different parts, and is one of the most satisfactory texts yet published. This is issued by the Macmillan Company. Ganong's Plant Physiology, Henry Holt & Co., contains explicit directions for carrying out the experiments demanded in the above course. Stevens's Introduction to Botany, D. C. Heath & Co., Boston, contains detailed directions for carrying on such a course as is outlined above. Peirce's Plant Physiology, Henry Holt & Co., contains a clear and up-to-date summary of our knowledge of physiological processes. Chamberlain's Methods in Plant Histology, issued by the University of Chicago Press, is an excellent guide to histological technique. Professor Coulter's books, Plant Relations and Plant Structures, beautifully written and illustrated, issued by D. Appleton & Co., New York, should be in every school library.

**ZOOLOGY.** One unit.

To meet the many and increasingly frequent requests for information concerning the teaching of zoölogy in the high school, this circular is issued. The growing importance of the biological sciences in both the high-school and college curricula makes necessary, so far as possible, the establishment of some standard which shall serve to coordinate the work of the different schools of the state. In addition to thus outlining a course of study, there will be included suggestions regarding laboratories, apparatus, and materials, which, it is hoped, may be of service. This is done because numerous letters received from the teachers of zoology throughout the state indicate the desire for assistance of this sort. It is the wish of the department of zoölogy at the University to be of service to the other public schools of the state in carrying on the work with which it is concerned, and it is hoped that the teachers of the secondary schools will come into as close touch as possible with the department and its instructors.

**Purpose of the Course.** There is hardly any necessity for saying that in making the suggestions regarding the high-school course of zoölogy that follow, the main thought kept in mind has been, not what would be best for the student who wishes to continue the subject at the University, but what will give him the best sort of training in that province of learning which it is the peculiar privilege of the observational sciences to occupy. And in this connection it may here be observed that the best teachers of these sciences do not regard the elementary courses as primarily designed for affording information, but rather as a means for training the mind to observe facts and to arrange and present these in a clear and logical manner.

**Character and Equipment of the Laboratory.** Obviously there can be no training of this sort by means of mere text-book work, and so it may be said in the beginning that the prime necessity of a course is direct study of the animals themselves. This necessitates a laboratory and suitable equipment. Regarding the room, it may be said that it is almost necessary to have it arranged so that it may be used for the one purpose alone, and to have it provided with tables rather than with desks. These need not be expensive, since the common kitchen table serves very well. Numerous windows are an advantage, and they are best situated on the north side. So far as general laboratory equipment is concerned it may be very simple. There will need to be receptacles for holding the specimens, and for this purpose stone jars of four or five gallons capacity serve excellently. Then some aquaria for live material are

needed. These may be purchased at reasonable prices, but in their absence candy jars, fruit jars, battery jars or any glass vessel of sufficient size will do. Ordinarily the greatest difficulty is encountered in the equipment of the individual student. The following account of such apparatus as the student finds necessary for his work was published in the *Journal of Applied Microscopy*, and indicates what it has been found possible to get along with at the University:

**Apparatus for the Individual Student.** The question of a suitable equipment for large laboratory classes in elementary zoölogy is often a most serious and perplexing one. Not only is it difficult to find the pieces of apparatus already made, but even when purchasable the attendant expense makes them unavailable in many cases where large numbers are required. In nearly every laboratory these difficulties have been met and solved more or less satisfactorily, usually by designing such apparatus as can be made in local shops.

Such a set for the individual student, evolved in actual practical work, is described here. Aside from dissecting pans and instruments, it consists of two pieces—one an easel, the other a standard for the support of lenses, etc. The easel is merely a piece of soft pine or poplar board  $5 \times 6 \times \frac{1}{4}$  inches, supported behind by a piece of bent wire attached by small staples. Crude and simple as this is, it insures better work from the student at a much less degree of personal discomfort than is otherwise possible. Since the style of drawing usually required of beginners is that known as orthographic projection, it becomes necessary to view the specimen from directly above each part drawn. If no support is provided, the student either lays the specimen upon the table and endeavors to look down upon it, or he props it against books or other objects so that it may be observed more easily. In either case the process is time-consuming and troublesome.

The specimen, a crayfish for example, is pinned to the board against a suitable shade of paper for a background, the appendages are arranged and secured to the board, which is then erected at such an angle that the line of sight falls upon it normal to the surface. In this position the animal is well lighted, is easily measured, and the tendency to introduce perspective in the drawing is minimized. When a lateral view is desired, the specimen is pinned to the top of the board near one side, the abdomen is flexed in a natural manner and fastened to the side, the appendages are brought down and secured, and the easel adjusted at the proper angle. It is not difficult to draw the animal when thus mounted, for a proper view is easily obtainable, and the edges of the board serve as guide-lines from which to measure.

The lens support is made by taking a piece of brass rod three-

sixteenths of an inch in diameter by ten inches in length, rounding one end with a file, and splitting the other in the center for an inch with a saw. Two holes are drilled through this end at right angles to the split, and then, after heating, the halves are bent out until the flat surfaces lie in one plane. By means of rivets passing through the small holes the rod is secured in the middle of a tin ointment box lid about three inches in diameter, which, in turn, is filled with melted lead. The standard thus produced is very firm and stable and occupies little room.

The lens holder attaching the magnifier to the standard is made by taking suitable brass or galvanized-iron wire and forming on one end a loop of a proper size to hold the lens, and on the other a close spiral of about four or five turns whose inner diameter is very slightly greater than that of the brass rod in the standard. Two of these are conveniently formed at one time by winding a spiral of eight or ten turns in the middle of a piece of wire twice the length of the desired support. This is then cut through the center and rings formed at the free ends for holding the lenses. It is advantageous to bend the support downwards so that the lens may be lowered over the edge of the dissecting pan. A lens thus supported may be swung around over a large specimen, and is conveniently focused by sliding the spiral up and down the brass rod.

This apparatus, by the addition of another lens support, serves an excellent purpose in the examination of small parts and dissections, and makes the use of the microscope much easier for the beginner. In making use of the apparatus for this purpose, it is arranged as follows: Upon the ring of the lower support is placed a piece of non-drying modeling clay (to be purchased of dealers in art and laboratory supplies). If the parts are to be examined dry, they are pressed down into the clay and arranged as desired; if they are to be immersed in water, a depression of suitable dimensions is made, and in the bottom the parts are secured. Water is now poured into the improvised pan and the specimen is ready for observation. Should specimens transfixed by pins be used, they are easily fixed and oriented in the clay. The holder is elevated to a convenient height above the table, the lens is focused, and the observer may then examine the specimen with one eye and, without moving the head, make the drawing.

The modeling clay previously mentioned is useful in many ways. When irregular objects are to be held in position, either upon the table, easel, or wire support, they may quickly and easily be secured by a piece of the clay. Small fragile structures, such as the mouth-parts of insects, are readily mounted in any position by pressing them into the surface of the clay. Numerous other uses suggest themselves in practical work which need not be mentioned.

Aside from the two pieces of apparatus described, nothing more is required for class use except dissecting pans and instruments. The former should be of different sizes, and may be made by pouring melted paraffin into suitable tin pans. It is usually desirable to have projections of some sort in the bottom to anchor the paraffin. For many purposes a black background is desirable, and this is obtained by mixing lampblack with the melted paraffin. Small pans may be made by using the bodies of the ointment boxes, the tops of which were utilized as the bases of the lens standards. Small pasteboard boxes thoroughly soaked in melted paraffin are light and convenient and last well.

Improvised dissecting instruments, except needles, are not to be recommended. Excellent ones, perfectly adapted to their purposes, may be purchased at reasonable prices, and are always to be preferred.

**Outline of the Course.** Every teacher has his own ways of working, and can secure the best results by following out the methods that seem to him best adapted to the time and place. Nevertheless, there are certain general principles that should govern the presentation of any subject, and in order to indicate the nature of these to such teachers as may be in doubt concerning the extent and character of the work involved in an elementary course in zoölogy, some suggestions may be given. In the first place, it must always be held clearly in mind that zoölogy is the study of animals and not of textbooks. Evidently enough, then, the course must be so arranged as to give the student the largest personal acquaintance with animal forms, and since it is obviously impossible to bring before him anything but a small representation of the animal kingdom, such a selection must be made as will give a place to all the important groups. In this matter of selecting the so-called "type specimens," there is a good deal of latitude which may be improved by utilizing common indigenous forms, but the temptation to take what is at hand must not be allowed to exclude from consideration representatives of important groups that are not so immediately available.

In making this selection of types, then, the first consideration is representativeness. The form chosen for study must be one that exhibits clearly the peculiarities of structure which mark the group of which it is a member. In general only the salient morphological points can be brought out, but in one or two forms that are particularly favorable a more detailed study can be undertaken with profit. By this means the relative values of structural characters as a means for determining the relationships of animals can be demonstrated practically. The number of groups that can be studied will depend to some extent upon the availability of the material and upon the

equipment with which it is to be studied. In general, representatives of the following branches will be found adapted to the ordinary high school: Arthropoda, Mollusca, Echinodermata, Annulata, Cœlenterata, and Vertebrata. Because of their numerical importance and practical bearing upon human affairs the arthropods may demand a more extended consideration than the other types.

To meet the requirements of the course there may be selected the following animals for the laboratory work: Crawfish; \* grasshopper; clam; starfish; earthworm; jelly-fish; frog. Of this list all except the starfish and jelly-fish may be found in practically any part of Kansas, so that as a matter of convenience they leave nothing to be desired. These forms represent their branches perhaps as well as individual species may, and are of convenient size to work with.

The order in which these forms are taken up is of no little importance, but it is scarcely possible to make a rule that is of general applicability. A strictly logical method of procedure would, of course, be to commence with the lowest forms and study the higher in the order of their complexity, or conversely, to note the highest development of morphological characters, and then to trace them back in the simpler animals. To most workers there have appeared practical objections to both plans. In the first instance the forms are small and require the use of a compound microscope, which places the beginning student at the double disadvantage of working with strange objects under quite unfamiliar conditions of observation. There is the further difficulty that an installment of compound microscopes is necessary, and this is often beyond the resources of the high school. The main objection to the second plan is that it introduces the student to a highly complex development of the various systems which not only renders necessary very skilful dissecting work, but occupies a disproportionate amount of time for attaining what is desired of the beginner. A compromise plan which is thought by many to obviate to a considerable extent the difficulties attaching to the others is to start the student out on a form of convenient size in which the various systems are well enough developed to show in a simple way the main features characterizing them. In this manner the principal structural features and relations of organism may be brought out in a somewhat diagrammatic way, and then by working down to the simpler forms the earlier stages of development may be seen and understood. Finally, with all this preparation, the vertebrate type may be

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\* This word is usually written *crayfish*, a corruption of the French *écrevisse*, but it seems to me that if the animal is to be called a fish at all the practice of the American boy in denominating it a *crawfish* is most apt, since the animal's stomach is so much like this part of the bird's anatomy in function.

studied and its complex structures appreciated. It is with this idea in mind that the arrangement of types previously suggested has been made.

The mere study of these few specimens, however, is not sufficient—such a course would be almost as bad as the use of a text-book alone. Two things are sought from the personal study of the type specimens by the student. In the first place, it trains his powers of observation and comparison, and gives the instructor an opportunity to determine where the weak points in his preparation and work are. The other end sought is to give the student a concrete, detailed image of one animal out of a representative group. With a definite conception thus established regarding the type specimen, it is possible to take up other members of the group and bring out the structural features of the various subgroups. As an example of how this part of the work may be carried on, the case of the grasshopper, the crawfish, and the other arthropods may be instanced. If the crawfish has first been studied as the representative of the lowest arthropod class, then the grasshopper, representing the highest class, after having carefully been worked out as an independent organism, may be compared system by system with the crawfish. This will develop the main resemblances and differences in the arthropods, so that the student will know what characters differentiate this branch from others. Specimens of the Arachnida and Myriapoda may then be examined and the further class distinctions noted. It is not necessary for the student to dissect and draw all the forms—it is, in fact, much better for the instructor to take a few students aside and confront them with the specimens, asking them to tell wherein they resemble the forms already studied. If they have previously listened to a lecture upon the whole arthropod branch or have read up in a good text upon the subject, they may be asked to classify the specimens into classes. When the main characters of the branch have thus been worked out by the student, attention may be turned to minor structural characters which serve to differentiate the subgroups.

To indicate how this part of the work may be presented, a series of comparisons based upon the grasshopper may be suggested. The grasshopper, from the order Orthoptera, may be compared with specimens of other insect orders, under the immediate supervision of the teacher, if possible, and these group characters brought out. When the students have acquired the ability to distinguish the insect orders, family characters in the Orthoptera may be illustrated by specimens of crickets, cockroaches, walking-sticks, etc. If it is thought desirable to go further, generic and specific characters may be pointed out in the type form studied. The general principle

always to be followed is to proceed from the known ground established by a study of the type into the unfamiliar territory occupied by the nearly related forms. When one branch is thus disposed of, another is taken up in a similar manner, and after having been worked over is compared with the previously studied group, so as to establish broad relationships connecting the two. In this way the student is gradually led to a general conception of the animal kingdom, based upon his own individual experiences.

Along with this first-hand observation and correlation work, which should be embodied in a well-kept note-book, there should go careful readings and recitations upon the general laws and phenomena appearing in animals. The life-histories of a few forms should be studied personally and read about by the students, and some simple physiological experiments carried out. It is a good exercise to have certain topics assigned for investigation and require written reports upon them. Insects offer good opportunities for this kind of work, and such questions as the following may cause the student to make profitable direct observations upon the living animal: "What structures and markings upon grasshoppers shield them from attacks of enemies?" "Describe the methods of flight in four species of grasshoppers." "Observe the actions of two grasshoppers when they meet—do they appear to have any means of communication?" "Do different species of grasshoppers appear to inhabit particular localities?" "What parasites can you find in or upon the grasshopper?"

**Collection and Care of Material.** In most cases it is a comparatively easy matter to secure supplies of grasshoppers, crawfish, clams, earthworms, etc., and wherever it is possible to have the fresh material it will usually be best to use it. When it is not convenient to keep or to secure specimens of this character, preserved material of the proper sort will serve most purposes. A rule that should almost invariably be observed is to secure material when it is plentiful, and not wait until it is needed. The cheapest and most convenient preservative is a solution of formaldehyde gas. This occurs in the market as a forty-per-cent. solution, called *formalin*, which is to be diluted to two per cent. or four per cent. A two-per-cent. solution is made by taking one part of formalin and nineteen parts of water; a four-per-cent. solution, by using one part of formalin and nine parts of water. Generally the specimens should go into the four-per-cent. solution for three or four days and then be kept in the weaker mixture. Earthworms must be killed and preserved in alcohol. If running water is available, sufficient live crawfish, clams, etc., may be kept in aquaria, or even in its absence, by keeping

aquatic plants with the animals they will thus secure enough oxygen. Earthworms may be kept in a tub of dirt, if it is moistened occasionally. Cages of screen wire may easily be improvised for keeping grasshoppers alive.

**Where to Purchase Supplies.** Microscopes and laboratory apparatus: Bausch & Lomb Optical Company, Rochester, N. Y.; Spencer Lens Company, Buffalo, N. Y. Marine specimens: Supply Department, Woods Hole Biological Laboratory, Woods Hole, Mass.; Henry M. Stevens, Carlisle, Iowa. Land and fresh-water forms: Wm. H. Bailey, Lawrence, Kan. Glassware, etc.: Whitall, Tatum & Co., Philadelphia, Pa.

### EUROPEAN HISTORY. Three units.

The entrance regulations of the University provide that two units of European history must be completed before the end of the Sophomore year. A unit is interpreted to mean one year of five hours a week in high school, or one term of five hours a week in the University. Credit is given only for work in English history, ancient history, *i. e.*, history of Greece and Rome, or medieval and modern European history, *i. e.*, the history of Europe since 800. One term's credit will be given to students presenting a year's work in the high school in any of these subjects. The department of European history offers three courses mentioned above in the Freshman and Sophomore years in the University, so that students who have not taken any or all of them during their high-school course have ample opportunity to do the work after entering the University. Students who receive credit at entrance for work done in the high school, however, cannot, of course, take the same work in the University for credit. Each of these courses, whether done in high-school or University, must be complete in itself, and no entrance credit can be given for such courses done as part of the work in general history. It is expected, of course, that the high-school work in history will include as much outside reading, map-making and note-taking as possible.

**Curriculum.** The American Historical Association has recommended that four years be given to the study of history in high schools, whenever it is practicable to do so. When this can be done, the first year should be devoted to Greek and Roman history, with a preliminary study of the oriental nations; the second year to medieval and modern European history; the third to English history; and the fourth to American history. Those schools which find it desirable to give only three years to history are recommended to place Greek and Roman history in the second year, English his-

tory in the third year, and American history in the fourth. When two years only can be given to history, either Greek and Roman or English history may be chosen, in which case the third year is recommended. If a separate course in medieval and modern European history is not given, English history should be treated with constant reference to European history. The department of European History in the University of Kansas hopes that those high schools which have a four-year course of study will, as far as possible, arrange their work in history according to the above plan, which has been elaborately discussed in the Report of the Committee of Seven.

**Text-books.** Within recent years a serious effort has been made to prepare good text-books in history for secondary schools. The text which will be found most satisfactory depends largely upon the school in which it is to be used and the teacher who is to use it. It should not be forgotten that a text which is satisfactory for the first-year class in high school may be unsatisfactory for the third-year class. Each teacher must learn by experience the text which, under given circumstances, is best. In selecting a text for Greek and Roman history the teacher will do well to examine those of Morey, West, Wulfson, and Myers. For medieval and modern history there are also four very good texts, Robinson, Munro and Whitcomb, West, and Myers. Robinson and Myers begin with the Germanic invasion of the fifth century; Munro and Whitcomb, and West begin with the empire of Charlemagne and devote much more space to the nineteenth century than to the earlier periods. There is even a greater number of books to choose from in English history. Coman and Kendall, Larned, Andrews, Wrong, Cheyney, Channing and Higginson, or Montgomery may be recommended. All of the books mentioned are furnished with lists of topics and references which enable the student to supplement the text-book work with outside reading of a general or special nature.

**School Libraries.** While it is believed that a text-book should be used for high-school work, it is desirable that every school should have at least a small library of reference books. Atlases are indispensable. For general European history, the best small atlas is Putzger's *Historischer Schul-Atlas*, which has been recently translated into English (Velhagen & Klasing, Leipzig, about seventy-five cents). Labberton's *Historical Atlas* (3800 B. C. to 1900 A. D., Silver, Burdett & Co., \$1.25), and Johnson's *Half-crown Historical Atlas* (Scribner, \$1), are also useful. A new atlas, covering the period from the Roman empire to the nineteenth century, by E. W. Dow, has been announced (Holt & Co.) For English history, Gardiner's *Atlas of English History* (Longmans, Green & Co., \$1.50) leaves

nothing to be desired, besides being of much service for general European history after the fifth century. The student should not only consult atlases, he should have practice in map-making. For this purpose outline maps may be secured very cheaply from the McKinley Publishing Company, Philadelphia, Rand, McNally & Co., Chicago, D. C. Heath & Co., Boston, or Ginn & Co., Boston. Reproductions of great paintings or photographic views of historic places are of some value in the study of history. There are several series of such pictures which may be had at slight expense. The "Perry Pictures" cost but one cent each (Malden, Mass.); the "Cosmos Pictures" about a half-cent each (296 Broadway, N. Y.); the "Soule Photographic Reproductions," Essenwein's *Bilder Atlas*, Vol. II, (Leipzig), and Parmentier's *Album Historique*, Vol. I (Paris), are more expensive.

Collections of "Sources" are numerous. Munro's Source Book of Roman History (D. C. Heath & Co.), Henderson's Select Historical Documents (Bell, London), the University of Pennsylvania Translations and Reprints, etc. (six vols., Philadelphia), and Adams and Stephens' Constitutional Documents, may be mentioned.

It is believed, however, that the high-school student can be interested to better purpose in the investigation of special topics in good secondary works, or in reading good biographies. Good biographies, in fact, are plentiful, and comparatively cheap, and a judiciously selected list of such books will probably be found more useful in a school library than anything else. For Greek and Roman history, Plutarch's "Lives" should by all means be secured. For medieval and modern history, Hodgkin's Theodoric, West's Alcuin, Lane-Poole's Speeches of Mahomet, Stephen's Hildebrand and his Time, Lane-Poole's Saladin, Sabatier's St. Francis of Assisi and Mirror of Perfection, Emerton's Erasmus, and Villari's Savonarola may be mentioned. There are some very good series of brief biographies for English history that can be secured at slight cost, such as the Twelve English Statesmen Series, Foreign Statesmen Series, etc.

**Class Recitations.** The best text book, the most fully equipped library, can nevertheless do but little toward insuring success in the teaching of history. Whatever success is achieved will depend ultimately upon the use which the teacher makes of the recitation hour. Aside from occasional written examinations, and supplementary oral or written reports, the recitation hour should mainly be devoted to developing the subject by means of questions and answers. Simple as it may seem to ask questions, this method, when properly used, requires ability of a high order and produces results which can be achieved in no other way. It is indispensable that the teacher

should have sufficient knowledge of the subject to conduct the recitation without reference to the text-book or to notes of any kind. He should have clearly in mind the main topics that he desires to develop and the order in which he wishes to bring them up. Although it is necessary to ask many questions which require mere memorizing of the text, the teacher should always endeavor so to frame the questions that success in answering will depend upon the student's ability to see relations between events. The test of successful questioning consists in the ability of the teacher to lead the student to follow a train of thought, based upon a given knowledge of facts, which, left to himself, he would never have followed out. It is hardly necessary to say that the teacher must himself be able to perceive more than lies on the surface, and he should carefully avoid what are known in the courts as "leading questions."

There are no rules for learning the art of successful questioning; success depends upon natural gifts and practical experience. Some very common mistakes however may be pointed out. Avoid questions on the one hand that can be answered by "yes" or "no"; on the other hand, generally avoid such as can be answered by memorizing the words of the text. Questions that require thought for an answer should be carefully distinguished from those that require guessing. The teacher must avoid a manner which leaves the impression upon the student that he is being quizzed for the mere purpose of showing up his stupidity or the teacher's cleverness. So far as possible each question should be determined by the preceding question and the answer which has been given to it. Questions should be frequently asked in such a way that the only hope of a successful answer depends upon having given close attention to the entire recitation. Questions should be short, clear, and precisely worded; the experienced teacher knows by instinct when the student has not understood the question, and when he does not know the answer or seeks to gain time. In a word, such questions should be asked as will (*a*) require accuracy of knowledge, (*b*) test the ability to see relations, and (*c*) demand concentration of attention throughout the recitation.

**Summary.** The department of European history thus desires of students who enter the University of Kansas that they shall at least have a good knowledge of the main facts of some particular period of European history, and, at best, a good knowledge of the main facts of the entire field; in either case it desires that they shall have had, in addition, some practice in the use of books, and some training in perceiving fundamental historical relations.

**AMERICAN HISTORY. One unit.**

High schools in which the historical courses conform to the recommendations of the Committee of Seven of the American Historical Association will devote the last year to American history. For this course the University provides one unit of entrance credit, but in order to receive credit it must not be given earlier than the third year in the high school. If given earlier in the course, little more can be accomplished than has already been done in the grades. The plan of the American Historical Association contemplates uniting American history and civil government, but it will be found in practice that the work in history will consume the entire year and that instruction in civil government can only be incidental.

In most cases it will be best to base the work in American history upon some approved high-school text. The best high-school texts are Channing's *Students' History*, McLaughlin's *American Nation*, Adams and Trent's *United States*, Montgomery's *Students' History*, and MacDonald's revision of Johnston's *High-school History*. With an adequate reference library and an especially equipped instructor, it may be desirable to carry on the work in American history by the topical method. For this purpose many systematic outlines are available. A very excellent one has recently been published by Supt. Geo. R. Crissman, of the Salina public schools. Even when a text is used, the outline is a useful adjunct, or the outline may be used with several texts in the hands of the class. Courses based upon the outline alone should be approved by the University High School Visitor. Historical geography is best taught by the aid of outline maps. A systematic series of outline maps, prepared by the department of American history of the University and published by Ginn & Co., illustrates all the territorial changes that have ever taken place in the United States. Where it is impracticable to take time to fill out the whole series, the books may be divided and the maps used separately.

Even with a text-book, a reference library is needed for supplementary reading. Good single volumes for a high-school library are Thwaites's *Colonies*, Eggleston's *Beginners of a Nation*, Parkman's *Struggle for a Continent*, Lecky's *American Revolution*, Burgess's *Middle Period and Reconstruction*, Dodge's *Civil War*, and Stanwood's *History of the Presidency*. The most useful sets are Fiske's *Historical Writings*, Schouler's *History of the United States*, The *American Statesman Series*, Hart's *American History by Contemporaries*, and MacDonald's *Charters, Documents and Statutes Illustrative of American History*. With a text this number of books will furnish ample supplementary reading, but for the library method it should be regarded as a minimum.

**MATHEMATICS. Three units.**

The requirement in mathematics for admission to the College of Arts and Sciences of the University of Kansas consists of one and one-half units of elementary algebra, and one unit of plane geometry. In the School of Engineering an additional half unit of solid geometry is required.

An additional half-unit of plane trigonometry and a half-unit of advanced algebra will be accepted by the University from such of its accredited schools as the High-school Visitor may certify are properly equipped to teach these courses.

Detailed accounts of the topics required and the suggestions as to the methods of teaching the various subjects are given below.

**Elementary Algebra.** One and one-half units. The text book in algebra adopted for the use of the Kansas schools is Wentworth's School Algebra. Since this book contains a larger amount of algebra than the average class can master in a year and a half under present conditions, some portions of it must be omitted, and it becomes necessary for the University to specify definitely just what portions of the book may be omitted and just what portions must be mastered by the pupils in order to fulfil its requirements for admission.

This task is most easily accomplished by enumerating the paragraphs, exercises, and chapters which may be omitted, and yet the pupils be fully prepared to enter the University classes. In this way the University lays down the essential things and the minimum amount of algebra which the preparatory schools must teach, but leaves them free to select such other topics as their time and local conditions may permit. But it is recommended that the high schools omit these designated topics and chapters from their course, and drill their pupils more thoroughly in the required topics.

Wentworth's School Algebra contains excellent lists of exercises which are generally well graded. Occasionally the author introduces problems and exercises which are too abstract for beginners, and should therefore be omitted.

These omissions and other suggestions are given in the following notes to the various chapters:

*Chapter 1.* Note 1.—As remarked in the preface this chapter should be read and *discussed* in the recitation room, and no attempt should be made to have the pupils *recite* it. Positive and negative numbers should be explained and illustrated graphically, as on pages 17-19. The rules of signs in multiplication and division should be learned, but beginners will neither appreciate nor profit by an abstract proof of them. The real work of the pupil should begin

with the exercises on the removal of parenthesis, and with addition and subtraction.

*Chap. II.* Note.—The vinculum is practically never used in mathematical work; therefore omit examples 16–20 in exercise 6.

*Chap. III.* Note.—Omit examples 37–40 in exercise 10; and 16 and 17 in exercise 12.

*Chap. IV.* Note.—Omit examples 42 and 43 of exercise 14, and all of exercise 16.

*Chap. V.* Note.—Solve every problem in this chapter.

*Chap. VI.* Note 1.—Omit all of article 109 and exercise 26.

Note 2.—Chapters II, III, IV and V are so elementary in their character and so suitable for younger pupils that they may well be taught in the grammar-school. The practical use and the disciplinary value of the methods of chapter V are worth more to the pupil than all the compound proportion, bank discount, cube root, etc., that are contained between the covers of the old arithmetics. The notion that all problems in the schools and in school examinations should be “solved by arithmetic” is inexcusable pedantry.

*Chap. VII.* Note.—The chapter on factoring is of fundamental importance and should be thoroughly learned.

*Chap. VIII.* Note 1.—This chapter contains two distinct methods for finding the highest common factor, and two corresponding methods for lowest common multiple. Case I, viz., the method by factoring, is the only one that the ordinary student of mathematics will ever be called upon to use in his subsequent work. This method is easy, and should be mastered.

Note 2.—The method given in case II is out of place in a course in elementary algebra for the following reasons:

(1) The proof of the method is too abstract and difficult for beginners, and is practically never mastered by them. Its proper place is in advanced courses of mathematics, in the University.

(2) The pupil does not need it in his subsequent work, and may pursue the science of mathematics to the end of his university course and never have occasion to use it except on artificial problems manufactured especially for the occasion.

Note 3.—Omit articles 139–146, exercise 39, article 151, and exercise 42.

*Chap. IX.* Note.—Omit example 5, article 155, and examples 28–35 in exercise 43. These are specimens of the artificial problems mentioned above. Omit example 3, article 168, and examples 14–17 in exercise 51. The rest of the chapter on fractions should be thoroughly mastered.

*Chap. X.* Note.—Articles 173–179 may be omitted at the discretion of the teacher.

*Chap. XI.* Note.—The use of “squared paper” and of graphical methods should be taken up in connection with this chapter. The pupil should now be taught to use coordinate axes, to “plot” points, to construct the “graph” of a first-degree equation in one and two variables, and to obtain graphically the solution of a pair of simultaneous linear equations. (See *Graphical Algebra for High Schools*, by H. B. Newson, published by Ginn & Co.)

Note 2.—Solve graphically the problems in exercise 58.

*Chap. XII.* Note.—Omit articles 195–197.

*Chap. XIII.* Note.—Do not spend much time on this chapter.

*Chap. XIV.* Note 1.—Special attention should be given to the binomial theorem contained in articles 210–212. Solve all the examples in exercise 69. (See note to chapter XV.)

Note 2.—Special attention should also be given to the finding of arithmetic square roots.

Note 3.—Omit all of cube root.

*Chap. XV.* Note.—In connection with the examples 29–34 of exercise 77, the pupils should solve examples 1–27 of exercise 112. This will meet all the requirements of the University on the binomial theorem.

*Chap. XVI.* Note.—Omit articles 257–261.

*Chap. XVII.* Note.—An understanding of imaginary expressions as treated in this chapter is essential, but many believe that it should be taken up after the quadratic equation has been studied. Its significance will then be better understood. See note 1 to next chapter.

*Chap. XVIII.* Note 1.—It is believed that the order in which the topics in this chapter and allied topics are taken up can be improved. The following order of topics is suggested: (1) The pure quadratic, articles 275–279; (2) the method of factoring, article 286, and numerous examples selected from exercises 34 and 35; (3) the method of completing the square by first dividing by the coefficient of  $x^2$ , article 280, and exercise 94; (4) literal quadratics, article 285; (5) solution by the formula, article 287; (6) properties of quadratics, chapter XX; (7) imaginary expressions, chapter XVII; (8) equations in quadratic form, articles 288, 289; (9) equations containing radicals, articles 290, 291; (10) problems involving quadratics, article 292; (11) simultaneous quadratic equations, chapter XIX.

Note 2.—The method of factoring should be presented early, in order to show the character of the problem and the existence of the

two roots. The pupil should clearly understand that relatively few simple problems are solvable by the method of factoring.

Note 3.—In order to avoid confusion of methods, it is best that the beginner be taught but one method of completing the square of a quadratic equation. Experience has shown that the method of completing the square after dividing through by the coefficient of  $x^2$  is the easiest for the pupil to remember. This method should therefore be taught, to the exclusion of all others.

Note 4.—After the pupil has been thoroughly drilled in the above-mentioned method of completing the square, he should be taught the formula of article 287. He should be convinced by numerous examples that the quickest way to solve a quadratic equation is to use the formula. The pupil should habitually use the formula in his subsequent work whenever he has a quadratic equation to solve.

Note 5.—The theory of the quadratic equation as discussed in chapter XX should be illustrated by the graphical method. Graphs should be constructed of quadratic equations, illustrating all possible combinations of roots, *e. g.*, both roots positive, both negative, one positive and one negative, one zero and the other positive or negative, both roots equal, roots imaginary, etc. The clear understanding thus gained more than compensates for the time required to learn the graphical method.

Note 6.—Omit articles 281–284, except exercise 94.

*Chap. XIX.* Note 1.—Omit article 295, and examples 37–42 of exercise 101.

Note 2.—The pupils should be taught to construct the graphs of equations of the second degree in two variables. These equations should be so chosen that their graphs will lead to the circle, ellipse, parabola, hyperbola. Solve graphically examples 1–18, 33–36, 54–58, of exercise 101.

*Chap. XXI.* Note.—Omit articles 322–326 and articles 329–337, and exercise 106. This chapter should be read in connection with pages 90–97 of book III of Phillips and Fisher's Geometry.

*Chap. XXII.* Note 1.—In arithmetical progression, omit examples 3 and 4 of article 343, article 345, and examples 11–30 of exercise 107. In geometrical progression, omit articles 350, 352, and examples 3–9 of exercise 108. Omit all of harmonical progression.

*Chap. XXIII.* Note.—Omit all the chapter.

*Chap. XXIV.* Note.—Omit all the chapter except exercise 112. (See note to chapter XV.)

*Chap. XXV.* Note.—Omit all the chapter. This chapter should be studied in connection with the course in trigonometry.

**Plane Geometry.** One unit. The text-book in geometry recently adopted (May, 1904) for use in the high schools of Kansas is Phillips and Fisher's Elements of Geometry, abridged edition. The change to this text from Wentworth's book necessitates some changes on the teacher's part in methods and in subject-matter, though for the most part the course in geometry in the high schools of Kansas is not greatly altered by this change in books.

While the former book was so large that it was almost impossible to solve all the problems in it in the allotted time, the present text-book is much smaller, and the number of exercises is so much reduced that all the book contains on plane geometry may easily be completed in one school year. Some schools and teachers will doubtless be able to complete books I-VI in one year, leaving books VII-IX to be completed in another half-year. The miscellaneous exercises on pages 333 and 334 should be taken in connection with the specific books they are intended to supplement, and not left until the end of the course.

One of the chief difficulties with which both teachers and pupils have to contend in the ordinary course in high-school geometry is that the pupils are called upon to acquire at one and the same time the elementary ideas of geometry, the terminology of geometry, and a knowledge of the nature and meaning of a logical proof. This difficulty would be largely overcome if these tasks were separated, so that the pupil could acquire his geometric ideas and vocabulary a year or more in advance of his undertaking the study of demonstrative geometry.

*Concrete Geometry in the Grades.* As long ago as 1892 the Committee of Ten, influenced by the mathematical curriculum of the schools of continental Europe, recommended that systematic instruction in concrete (intuitional, non-demonstrative) geometry be given in the grammar grades. (See the Report of the Committee of Ten.)

Besides the above-mentioned difficulty in the teaching of the ordinary course in high-school geometry, there are weighty reasons for the introduction of some elementary geometry in the grammar grades. A very large percentage of the children in these grades never reach the high school. From their ranks is largely recruited the army of mechanics and skilled laborers of all kinds. A knowledge of the simpler facts of geometry is extremely useful in after-life to large numbers of people of this class. The public-school system should therefore be adapted to their needs and they should be given an opportunity to acquire in their school-days this useful knowledge.

Concrete geometry is in its nature less abstract than many of the arithmetical theories usually taught in these grades, and is therefore

better suited to the immature minds of the pupils than the more difficult processes of analysis which make up so large a part of the course in arithmetic.

It may be objected that the above suggestions are innovations which are contrary to the traditional course in geometry in American and English schools; but the experience of continental Europe has established its practicability so thoroughly that its superiority to the common method cannot be denied. The same thing is being done in many schools in this country with absolute success.

A few words on the various methods of introducing this study into the grammar grades.

*Blocks and Models.* Mensuration is not the last topic that should be taken up in the course in arithmetic, but work on this subject should be carried on throughout the seventh and eighth grades. A good set of geometrical blocks and models can be used here with great profit to the pupils. Such a set can be purchased for a small amount. (One of the best sets on the market is sold by W. D. Ross, Fremont, Ohio, for \$12.)

The amount of geometrical knowledge to be acquired from such a set of blocks, or from the subject of mensuration illustrated by blocks, is a good preparation for high-school or demonstrative geometry.

*Geometrical Drawing.* Closely connected with concrete geometry on the one hand, and on the other associated with the manual-training idea, is the subject of geometrical drawing. This might be taken up in connection with the work in free-hand drawing or in manual training. All the essentials of the course in concrete geometry advocated above might be given in a course in geometrical drawing.

The necessary outfit is very simple; the pupil should provide himself with a pair of compasses, a ruler, a protractor, and a small drawing-board. The following sample outfit will be found very satisfactory:

The Eagle compasses, No. 569, price twenty-five cents.

A hardwood ruler with inches and fractions on one edge and centimeters on the other edge, five cents.

A German silver protractor, twenty-five cents; paper ones, thirty cents a dozen.

The Springfield drawing kit, thirty cents. (Western agents, Hoover Bros., Kansas City.)

Pupils soon acquire dexterity in the use of these simple tools, and through their proper use soon accumulate a large fund of useful geometrical knowledge.

*Problems of Construction.* These tools should be used in con-

nection with the ordinary course in high-school geometry, no matter whether the pupils have previously learned their use or not. Every problem of construction in Phillips and Fisher's geometry should be carefully drawn on suitable paper as accurately as the tools at hand will permit. With the simple outfit described above a very high degree of accuracy may be obtained. It is not enough for the pupil to learn the theory of geometrical construction; he should also be taught how to apply the theory to actual practice. For example, it is not sufficient that the pupils be able to *tell* how to construct a square equivalent to the sum of two given squares, but they should be able to do it and do it accurately and neatly. The accuracy of the result should be verified, whenever possible, by actual measurement. In the chemical or physical laboratory it is not regarded as sufficient that the pupils are able to tell how to do a certain thing; they must be able to do it. It should be the same in geometry.

*Text-books in Elementary Geometry.* There are a number of text-books in concrete geometry on the market intended for the use of pupils in the grammar grades; a few of these are mentioned here. These books may be obtained from the publishers. Baker's *Elementary Geometry*, Ginn & Co.; Nichol's *Introductory Geometry*, Longmans, Green & Co.; Hornbrook's *Concrete Geometry*, American Book Company; Campbell's *Observational Geometry*, American Book Company; Dodd and Chace, *Elements of Algebra and Geometry*, Kimberly Publishing Company, Kansas City, Mo.; Hailmann's *Constructive Form Work*, P. C. Burchard & Co., Boston, Mass.

The last one mentioned is the best for young children in the lower grades. Baker's little book is one of the best of its kind for more advanced pupils, and is well adapted for the upper grammar grades or the first year of the high school.

**Solid Geometry.** One-half unit. Solid geometry, one-half unit, is required for entrance to the School of Engineering, but is not required for entrance to the College of Arts and Sciences. If not offered for entrance to the College, it must be taken in the first term of the Freshman year. All accredited schools teach solid geometry, and so it is recommended that, as far as possible, candidates for admission to the College offer solid geometry for entrance.

All of Phillips and Fisher's Solid Geometry, including the miscellaneous exercises at the end of the text, must be taken by the pupil in order to meet the requirements for entrance to the School of Engineering.

In connection with the course in solid geometry the use of blocks and models is urged, and accurate drawings should be strongly insisted on. In this connection it will be found useful to have the

pupils construct cardboard models of as many of the solids studied as is possible. Patterns for a large number of these models are to be found in Campbell's *Observational Geometry* (American Book Company).

*Fourth-year Mathematics.* At present only a few high schools in Kansas give courses in trigonometry or college algebra. Hereafter plane trigonometry and college algebra, one-half unit each, may be offered for entrance and counted among the fifteen units required for entrance. It is expected that this privilege will stimulate most of the stronger high schools of the state to introduce these courses into their curricula. Where both are taught, trigonometry should precede college algebra.

**Plane Trigonometry.** One-half unit. The course in plain trigonometry should follow the outline printed in the University catalogue. Any good modern text-book will do. Problems should be solved by use of the tables of natural functions before logarithms are introduced. The study of the theory and use of logarithms should be taken up in connection with the trigonometry at the time it is needed.

**College Algebra.** One-half unit. The term "college algebra" in the past has stood for the most indefinite thing in the whole mathematical curriculum of American schools. The lists of subjects in the various text-books on college algebra bear evidence to the same fact. The recent action of the joint committee mentioned in the University catalogue under "Entrance Requirements in Mathematics" has done much to standardize this course.

A half-unit of college algebra to be accepted by the University must conform as closely as possible to the outline printed in the University catalogue. The topic, *permutations and combinations*, may be omitted at the discretion of the teacher. All subjects involving infinite series should be omitted and the stress chiefly placed on complex numbers, determinants, the theory of equations, and their application.

In the solution of numerical equations the roots should be located by means of the graph and their approximate values found by Horner's method. Sturm's theorem should not be given. The algebraic solutions of the cubic and quartic may be included if time permits, but they are not required.

**General Remarks.** The modern tendency in mathematical instruction in secondary schools of the country is toward unification of the various branches of the science and its correlation with allied sciences. The teacher should always hold in mind that arithmetic, algebra and geometry are not separate sciences, but closely connected

branches of one science, viz., mathematics. The arithmetic, algebra and geometry should be intermingled as intimately as possible. Many problems of algebra should be geometrical in character, and many problems in geometry should be solved by algebra. The unity and not the divergency of the science should be emphasized. In the high-school course mathematics and physics have contact at many points, or, rather, they interpenetrate each other in many regions. Both should be taught in such a way as to emphasize this relationship.

The order in which the subjects are taught must be governed by local considerations. As matters now stand in most Kansas schools, it is believed that the best temporary arrangement is as follows:

First year.—Algebra to quadratic equations or thereabouts.

Second year.—Plane Geometry.

Third year.—Algebra with required work completed, and Solid Geometry.

Fourth year.—Plane Trigonometry and College Algebra.







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**High-School Manual,**  
**No. III.**



**October, 1905.**

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**The University of Kansas,  
Lawrence.**

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**High-School Manual,  
No. III.**

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**October, 1905.**

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## Preface.

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THE UNIVERSITY, in pursuance of a policy inaugurated two years ago, offers for free distribution a third edition of the High-School Manual. The secondary schools of the state are each year becoming more closely affiliated with the University, which is due in no small degree to a mutual understanding with reference to limitations, aims and possibilities of all concerned, as set forth annually in this manual. The increased demand indicates this and justifies its publication. No effort is made to deal with the broader problems of public education. The field is the secondary school in its relation to the University, and the chief aim, to present, in condensed form, a clear statement of entrance requirements, a definition of a unit of work in each subject, and some suggestions on equipment, books of reference, and program of studies. Were it not for the fact that high schools must provide for lines of work not included in a college preparatory course, the manual might be considered a course of study for high schools.

Many instructors have found difficulty with material at hand in extending the subject of physical geography for a unit's credit. The text adopted by the commission is intended to cover only a half-year's work, and in the majority of schools the conditions are such that laboratory and field-work are either impracticable or else are attempted without any definite plan. A complete outline for a year's work in this subject has been prepared especially for this manual, which will fully cover the requirements for a unit of credit. It includes the entire subject of physical geography as it is now taught in the best schools. Teachers of this subject will find no difficulty in holding their classes throughout the year if they are provided with the books of reference, maps, apparatus, etc., indicated in the outline.

In all other required subjects the suggestions are essentially the same as appeared in the manual of last year. Any question as to the kind or amount of work, methods, apparatus or other equipment, course of study or accredited relations may be answered by carefully reading the article on the subject in question. It is believed that principals and instructors will find it worth their while to read the manual carefully and then file it for frequent reference. The lack of funds necessarily limits the edition, and while the intention is to place a copy in the hands of every high-school teacher, at the same time waste must be guarded against.

The University desires to cooperate with school authorities in advancing the interests of secondary education, and to this end invites correspondence and mutual confidence. .

HIGH-SCHOOL VISITOR.

## **Annual Conference.**

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SOME time during the month of April the principals and teachers of accredited high schools will be invited to the University to take part in a conference upon the subject of "Foreign Languages in the High Schools." Experience has taught us that these meetings are helpful in many ways. The efficient work which is being accomplished by the Mathematics Teachers' Association was first inspired by the conference that met two years ago. The meeting of last year not only brought before the teachers many interesting discussions, but it also created a genuine enthusiasm and a wholesome desire for better teaching of English. All high-school teachers should make an effort to attend these meetings. While the attendance has been good in the past, even beyond expectation, yet, as is often the case at such meetings, the persons who needed help most were not present.

The object of the conference is to bring instructors, principals and officials together for a free and informal discussion of high-school problems, and more especially those questions that bear directly upon accredited relations. It also affords an opportunity to listen to some of the best teachers of our country — those who are leaders in the profession and have been recognized as authority. No teacher can well afford to deny himself these advantages, and especially the teacher who has had but little experience.

As stated above, the subject for discussion at the next conference is "Foreign Languages in the High Schools." Every phase of the subject will be touched upon, and every teacher will have an opportunity to ask questions or offer suggestions. During the first day of the conference will occur the annual high-school meet, to which all students of accredited schools are invited, for the purpose of competing in athletic exercises.

Programs will be mailed to teachers early in the year.

## **Accredited Schools.**

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All high schools which are able to maintain a high standard of proficiency in the various departments and which have adopted a course of study covering four years of required work are recognized by the University of Kansas by placing them on an accredited list. This list is revised every year and published in the manual and annual catalogue. The graduates of schools thus affiliated with the University, when recommended by the principal or superintendent, are entitled to credit towards entrance to the Freshman class without examination, provided the subjects for which they ask credit are distributed according to the required groups as indicated under "Admission."

An accredited school should fulfil practically all of the following requirements:

1. The instructors should be well qualified, and, when possible, specially trained, both with reference to subject-matter and method, for a certain line of work. They should be graduates of a university, college, or high-grade normal school.

2. Instructors should not be required to carry more than six recitations per day, and these should be confined to two lines of work, if possible.

3. In the larger high schools (those enrolling 300 or more), the principal should have at least one-half of his time for supervising the work of his teachers. In the smaller schools, he should have from one to three periods a day for the same purpose.

4. The laboratories should be furnished with tables for individual work and such apparatus as is necessary to enable the students to perform all experiments indicated in the texts adopted by the Text-book Commission. (For lists of apparatus, cost, etc., see this manual, under Physics and Chemistry.)

5. A laboratory period should be twice the length of a recitation period, and in each of the sciences there should be two laboratory periods per week.

6. Students should have access to standard books of reference and supplementary works in literature, history, science, and art.

7. The course of study should be approved by the High-School Visitor.

8. For a definition of a unit for entrance requirement, see admission to College of Liberal Arts and Sciences, page 16.

A school to be fully accredited should meet the above requirements. While many schools have been fully recognized in the past that came short of this high standard in some respects, it is gratifying to know that the majority of them have improved to such an extent that they are entitled to affiliation privileges without any conditions whatever. About thirty schools have equipped physical and chemical laboratories within the past year. In many cases the teaching force has been increased in number and efficiency; the school year has been lengthened to full thirty-six weeks; the environments of the school have been made more attractive. The standard is high, it is true, but not beyond the possibilities of the high schools of Kansas. There is satisfaction in knowing that the standard is the best. If time be given, school officials, with wise direction, will meet every requirement, and the University is ready to cooperate in every possible way.

Eighty-eight schools are fully accredited for the year 1905-'06; of these, fifteen are located in other states or territories. While the University will accept for entrance any work done in these schools, it must be recognized that the conditions for excellent work are more favorable in some than in others. Such a difference is not always a mark of discredit. Usually local conditions have not been such as to warrant the board of education in meeting all the requirements for a first-class school.

# List of High Schools Fully Accredited.

I.—Schools\*named in this list are working under the most favorable conditions.

<i>Name of school.</i>	<i>Superintendent.</i>	<i>Principal.</i>	<i>Number of Seniors.</i>	<i>Total enrollment.</i>
Abilene.....	W. B. Hall	N. U. Spangler	22	153
Argentine.....	H. P. Butcher, A. B.	Minnie J. Oliverson, A. B.	15	106
Arkansas City.....	L. W. Mayberry, A. B.	R. S. Whitelaw	21	185
Aitchison county, Effingham		J. W. Wilson, A. B.	26	
Beloit.....	J. O. Hall, A. B.	J. H. Adams, A. B.	21	141
Clay county, Clay Center		S. A. Bardwell	37	250
Concordia.....	A. B. Carney	Martha Whitney, A. B.	18	150
Coffeyville.....	W. M. Sinclair	H. F. Dwell	22	152
Chase county, Cottonwood Falls		B. F. Martin	7	118
Decatur county, Oberlin.....		H. Q. Banta, A. M.	16	131
Dickinson county, Chapman		Homer S. Myers, A. M.	28	192
Ellisworth.....	E. T. Fairchild	L. H. Beall, A. B.	7	91
Emporia.....	L. A. Lowther, A. B.	W. L. Holtz, A. B.	46	228
Eureka.....	B. E. Lewis, A. B.	W. A. Bailey	17	166
Fort Scott.....	D. M. Bowen, A. B.	F. M. Hammitt, A. M.	52	300
Galea.....	Leslie T. Huffman	Ray E. Merwin, A. M.	18	120
Garnett.....	C. H. Oman, A. B.	Geo. H. Marshall	16	134
Great Bend.....	C. A. Strong	W. L. Bowersox	12	97
Holton.....	E. L. Holton, A. B.	C. D. Ise, A. B.	17	164
Hutchinson.....	R. R. Price, A. M.	Chas. A. Wagner, A. B.	20	209
Halstead.....	C. O. Smith	Orel McCroskey, A. B.	9	71
Hiawatha.....	Geo. G. Pinney, A. B.	A. C. Andrews, A. B.	25	114
Iola.....	Miss Clifford A. Mitchell	L. H. Wishard	29	211
Junction City.....	W. S. Heusner, A. M.	R. F. Mills, A. B.	16	182
Kansas City, Kan.....	M. E. Pearson, B. D.	W. C. McCroskey, A. B.	90	717
Labette county, Altamont.....		W. M. Kyser, A. B.	38	163
Larned.....	W. S. Robb, A. B.	Ora Mower, A. B.	12	70
Lawrence.....	F. P. Smith, A. M.	F. H. Olney, A. B.	64	544
Leavenworth.....	G. W. Kendrick	W. A. Evans	44	302
Minneapolis.....	A. F. Senter, B. S.	D. O. Smith, B. S.	14	88
McPherson.....	C. W. Kline, A. B.	Clinton Wright	10	125
Lewis Academy, Wichita.....		J. M. Naylor, A. M.	24	129

Marysville.....	C. B. Myers, A. B.	T. L. Eyerly, A. B.	14	72
Montgomery county, Independence.....	D. F. Shirk, A. B.	S. N. Nees, B. S.	22	248
Newton.....	R. L. Parker, A. B.	O. J. Silverwood, A. B.	19	167
Norton county, Norton.....	A. L. Bell, Ph. B.	H. H. Gerardy	27	182
Olathe.....	E. D. George, A. B.	G. M. Husser, Ph. B.	22	170
Paola.....	J. A. Higdon, A. M.	F. K. Ferguson, B. S.	19	205
Parsons.....	A. H. Bushey	Louise M. Schaub.	25	206
Pittsburg.....	George E. Rose, B. D.	J. E. Crawford	23	168
Rosedale.....		Anna D. White, A. B.	39	209
Reno county, Nickerson.....		E. B. Smith, A. M.	8	68
Southern Kansas Academy, Eureka	G. R. Crissman, A. B.	W. E. Faught, B. S.	20	188
Salina.....	C. C. Starr, B. S.	John Lofty, A. B.	10	100
Seneca.....	T. H. Hooper, A. B.	Pearl McCurdy, B. S.	17	288
St. John's Military School, Salina.		R. H. Mize, A. B.	11	71
Smith Center.....	Geo. L. Seeley, A. B.	D. H. Rose, A. B.	7	93
Sumner county, Wellington	R. A. Hampshire, M. S.	Thos. W. Butcher, A. M.	29	72
Sterling.....	L. D. Whittemore, A. M.	Jeanette Inches, Ph. B.	13	400
Sedgwick.....	W. D. Vincent, A. B.	Adaline Finn	10	112
Thomas county, Colby.....	R. F. Knight	Wm. E. Ray, A. M.	23	61
Topeka.....	John W. Spindler, A. M.	H. L. Miller, A. B.	149	150
Washington.....		C. H. Myers, A. B.	20	1,017
Wichita.....		E. H. Ellsworth, A. M.	46	99
Winfield.....		C. H. Rhodes, A. M.	24	553
				163

## II.—Schools named in this list fall short of the most favorable conditions in some respects.

<i>Name of school.</i>	<i>Superintendent.</i>	<i>Principal.</i>	<i>Number of Seniors.</i>	<i>Total enrollment.</i>
Anthony.....	J. H. Clement, A. B.	Jennie G. Fones, A. B.	7	74
Atchison.....	Nathan T. Veatch.	A. H. Speer, A. B.	11	188
Burlingame.....	C. A. Deardorff.	Grace Brigham, A. B.	18	95
Burlington.....	W. A. Stacey, B. S.	Myrtle Collins, A. B.	15	66
Chanute.....	J. H. Adams.	J. A. Cannan.	21	170
Crawford county, Cherokee.	A. M. Thoroman.	W. S. Pate.	26	136
Council Grove.	A. J. Lovett, A. B.	Irene Pemberton, A. B.	11	85
Cherryvale.....	C. M. Ware.	Bennett Grove.	16	100
Clyde.....	Warren Baker.	Emma Palmer, A. B.	11	46
El Dorado.....	T. A. Edgerton.	J. A. Hall, A. B.	21	131
Gove county, Gove.	E. C. Hackney.	S. E. Lee.	12	26
Lyons.....	C. L. Williams.	R. G. Henderson.	9	78
Osage City.....	W. D. Ross, A. M.	L. E. Swenson.	13	88
Osawatimie.....	A. J. Beatty, B. S.	May E. Williams, A. B.	9	81
Peabody.....		Alinthe Spilman, A. B.	9	59
Sheridan county, Hoxie.		R. G. Mueller, A. B.	6	33
Wamego.....		Grace Eaton, A. B.	17	87

III.—Schools named in this list are not located in Kansas, but are working under the most favorable conditions and are duly accredited schools.

<i>Name of school.</i>	<i>Superintendent.</i>	<i>Principal.</i>	<i>Number of Seniors.</i>	<i>Total enrolment.</i>
Albuquerque, N. M.	J. E. Clark.	J. A. Miller, B. P.	11	82
Beaverhead county, Dillon, Mont.	F. N. Howell.	L. R. Foote.	8	75
El Reno, Okla.	W. P. Roberts.	Warren Ingold, A. B.	6	105
Joplin, Mo.	J. M. Greenwood, Ph. D.	S. A. Baker.	33	301
Kansas City, Mo., Manual Training	J. M. Greenwood, Ph. D.	E. D. Phillips, Ph. M.	225	1610
Kansas City, Mo., Central	J. M. Greenwood, Ph. D.	I. I. Cammack.	185	1410
Kansas City, Mo., Westport	J. M. Greenwood, Ph. D.	S. A. Underwood.	53	424
Kemper Military, Boonville, Mo.	Ed. S. Vaught, B. S.	T. A. Johnston, A. M.	8	84
La Junta, Colo.	J. A. Whitford.	O. J. Blakeley, Ph. D.	30	155
Oklahoma City, Okla.	W. E. Morrow, B. P.	J. B. Taylor.	42	376
Prosser preparatory school, Kansas City, Mo.		J. P. Richardson, A. B.		50
St. Joseph, Mo.		R. H. Jordan, A. B.	51	851
Warrensburg, Mo.		Edward Beatty, B. P.	14	170
Wentworth Military Academy, Lexington, Mo.		S. Sellers, A. M.	18	135
Western Military Academy, Upper Alton, Ill.		Albert M. Jackson.		

# List of High Schools Not Fully Accredited.

I.—The forty-nine schools named in this list fall short of full preparation by not more than three units.

<i>Name of school.</i>	<i>Superintendent.</i>	<i>Principal.</i>	<i>Number of Seniors.</i>	<i>Total enrolment.</i>
Augusta.....	W. F. Rice, A. B.	Carmie Wolfe, A. B.	12	61
Burton.....	Robt. N. Halbert, Ph. B.	Ida Shive, A. B.	7	50
Belle Plaine.....	C. H. Landrum, A. B.	Lulu Grosh, A. B.	1	31
Blue Mound.....	A. D. Hiatt, A. B.	Ellen Dingus, B. S.	5	36
Cawker City.....	A. P. Gregory, B. S.	A. M. McKechnie.	3	34
Clifton.....	G. B. Buikstra, A. B.	W. A. Cain	8	42
Carbondale.....	Chas. Kelley	Grace Lyon	7	36
Centralia.....	A. W. Jarrett.	Carrie Beery, A. B.	9	43
Delphos.....	M. C. Shaible, B. S.	Inez Dickinson, B. P.	6	39
Dodge City.....	C. A. Smith, A. B.	Roger Dean, A. B.	7	81
Douglas.....	J. H. Gibson	Etta Marshall	5	41
Frankfort.....	M. G. Kirkpatrick	Harriet Landers	8	64
Fredonia.....	I. L. Garrison, B. S.	H. M. Starns	7	69
Florence.....	C. E. St. John	Bertha Van Hove.	6	44
Garden City.....	E. F. Ewing, A. B.	Mae Cathcart, Ph. B.	12	92
Girard.....	H. W. Shideler, A. B.	Lillian Bell, A. B.	24	80
Hays.....	R. T. Madden, A. B.	Miss A. Foster	5	30
Herington.....	W. W. Jones	Lavonia M. Donica.	10	83
Horton.....	W. W. Wood, A. B.	Wm. M. Blair, A. B.	8	55
Harper.....	E. E. Sluss, B. S.	Margaret Dean	13	57
Howard.....	Harley I. French.	Hallie D. Paynter.	12	66
Humboldt.....	J. E. Cook	A. I. Decker	5	44
Kingman.....	Alvin W. Ault, A. B.	Margaret Benedix	9	98
Kinsley.....	D. A. Baugher	D. A. Baugher	3	54
Lyndon.....	L. S. Runnels	Margaret Kelley, A. B.	14	83
Lane county, Dighton.	J. E. Chamberlain	Herman Gillette, A. B.	30	30
La Cygne.....	H. H. Van Fleet, A. B.	Mary E. Smith	8	71
Marion.....	F. W. Simmonds, M. S.	Clara Morris	13	94
Mankato.....	J. L. Shearer, B. D.	S. J. Butts, A. M.	4	20
Moline.....	J. M. Steffen	Delia Bates	5	77
Neodesha.....	E. H. McMath, A. B.	G. F. Collins	10	77
Nortonville.....		Lena McConnell, A. B.		54

Overbrook.....	C. H. Hepworth, Ph. B. ....	Helen Ingham, A. B. ....	15	55
Osborne.....	B. K. Farrar, B. S. ....	Kate C. Clark, A. B. ....	10	75
Phillipsburg.....	T. O. Ramsey, A. B. ....	Olive Thomas.....	1	30
Pleasanton.....	John Groendyke, B. S. ....	Edith Bowers, A. B. ....	4	38
Pratt.....	W. Falkenrich, A. B. ....	Irene Crawford, A. B. ....	5	78
Plainville.....	C. E. Rarick, A. B. ....	Myrtle Pidet.....	8	44
St. John.....	C. M. Hilleary.....	J. H. Byers, A. B. ....	6	56
Sabetha.....	Geo. T. Beach, A. M. ....	Susie M. Guild, A. B. ....	25	137
Scott county, Scott City.....		R. Bullimore.....		23
Stafford.....	Arthur L. Stickel, A. M. ....	Henrietta Hall.....	12	42
Stockton.....	J. F. Smith, B. S. ....	Mrs. S. K. Smith, B. S. ....	11	57
Scranton.....	John Linn.....	John Linn.....	8	45
Sherman county, Goodland.....		S. V. Mallory, B. S. ....	4	36
Trego county, Wa Keeney.....		J. H. Niesley.....	3	47
Valley Falls.....	S. D. Dice.....	Maud Myers.....		43
Waverly.....	Geo. R. Tilford.....	Jessie A. Fear, A. B. ....	8	49
Russell.....	J. N. Banks, A. M. ....	Alden Dannevik.....	10	77

II.—Schools named in this list offer courses that have been approved by the University, but they have not yet been able to fulfil other conditions for accredited relations.

<i>Name of school.</i>	<i>Principal.</i>	<i>Number of Seniors.</i>	<i>Total enrolment.</i>
Attica .....	W. L. Dunbar.....	2	31
Beattie .....	C. Kraemer.....		45
Blue Rapids .....	A. J. Clark, A. B. ....	11	60
Boling .....	Harriet Woodward .....		14
Buffalo .....	H. E. Clewell .....	5	27
Burr Oak .....	F. Eaton.....	12	41
Caldwell .....	D. C. Porter .....	9	74
Colony .....	John B. White .....	8	31
Corning .....	J. W. Roberts.....	4	33
Erie .....	F. L. Pinet .....	1	37
Ellis .....	B. E. Ford.....		
Gas City .....	H. D. Ramsey .....	4	32
Glasco .....	Inez Chapman, A. B. ....	9	38
Glen Elder.....	R. L. Hamilton .....	1	42
Greenleaf.....	A. P. Warrington.....	12	40
Gypsum .....	J. E. Coe.....	4	28
Goff .....	Chas. A. Richard, A. B. ....	6	22
Havensville.....	P. R. Hamm .....		
Hill City .....	A. E. Lunceford.....		15
Hartford .....	Anna H. Brogan.....	10	32
Hillsboro.....	J. W. Shideler .....	6	25
Kincaid.....	Thomas E. Osborn.....	4	27
La Harpe .....	A. J. Baker.....		
Louisburg .....	Floyd B. Lee.....	8	35
Lansing .....	James B. Kelsey.....	7	31
Logan .....	Wm. R. Arthur, A. B. ....		
Lecompton .....	J. W. Murphy, A. B. ....	4	20
Leon.....	James I. Knott .....	5	19
Linwood .....	E. E. Heath .....	3	18
Le Roy .....	C. T. Sherwood .....	9	62
Maplehill .....	J. H. Houston .....	1	9
Marquette .....	V. H. Moon.....	12	34
Moran .....	Geo. E. Jones.....	7	34
Oskaloosa.....	W. A. Anderson.....	4	50
Quenemo .....	E. L. Heilman .....	6	26
Reading .....	F. E. Robinson.....	6	33
Sylvan Grove .....	John A. Fleming .....	1	22
Syracuse.....	H. E. Walter.....	2	24
Springhill.....	C. H. Brooks.....	1	49
Tonganoxie.....	F. Brackett.....	5	41
Westmoreland .....	F. W. Comfort.....	1	23
Wetmore .....	L. M. Duvall .....		
Wilson .....	H. Coover.....	11	34
Williamsburg .....	J. F. Lyon.....	3	29
Weir City .....	R. Rankin.....	9	31
Yates Center .....	F. M. Patterson.....	24	108

# High-School Program of Study.

## First Year.

### FIRST SEMESTER.

- Required :  
 English.  
 Algebra.  
 Electives (choose two):  
 Latin.  
 Physiography.  
 Arithmetic.

### SECOND SEMESTER.

- Required :  
 English.  
 Algebra.  
 Electives (choose two):  
 Latin.  
 Physiography.  
 Physiology.

## Second Year.

### FIRST SEMESTER.

- Required :  
 English.  
 Algebra.  
 Electives (choose two):  
 Latin.  
 German.  
 Botany.  
 Greek and Roman history.

### SECOND SEMESTER.

- Required :  
 English.  
 Geometry.  
 Electives (choose two):  
 Latin.  
 German.  
 Botany.  
 Greek and Roman history.

## Third Year.

### FIRST SEMESTER.

- Required :  
 English.  
 Geometry.  
 Electives (choose two):  
 Latin.  
 German.  
 Chemistry (or physics in three-year course).  
 Medieval and modern history (or American history in three-year course).  
 Zoology.  
 English history.

### SECOND SEMESTER.

- Required :  
 English.  
 Geometry.  
 Electives (choose two):  
 Latin.  
 German.  
 Chemistry (or physics in three-year course).  
 Medieval and modern history (or American history in three-year course).  
 Zoology.  
 English history.

## Fourth Year.

### FIRST SEMESTER.

- Electives (choose four):  
 English.  
 Physics.  
 Latin.  
 German.  
 American history.  
 Trigonometry.  
 Economics.

### SECOND SEMESTER.

- Electives (choose four):  
 English.  
 Physics.  
 Latin.  
 German.  
 American history.  
 Bookkeeping.  
 Economics.

NOTE.—Every subject which appears on this program of study, if continued one year, is accepted for entrance credit, with exception of physiology, arithmetic, and bookkeeping.

## Entrance Requirements.

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### College of Liberal Arts and Sciences.

Professor OLIN TEMPLIN, A. M., Dean.

#### Admission.

There are two methods of admission to the College of the University: First, by examination; second, by certificate.

1. BY EXAMINATION.—Candidates for admission to first-year work in the College of the University, not presenting the required certificates, will be examined at the University, Lawrence.

Candidates for admission may divide the examination between two years, or between June and September of the same year, under the following conditions: The applicant may present himself at the preliminary for examination in any or all of the prescribed subjects, and, if he is successful in five or more subjects, he need not be again examined in them.

Examinations for advanced standing on work done in preparatory schools, not required for admission, will be held at the same time as entrance examinations above.

2. BY CERTIFICATE.—Nearly all students enter the College by certificate from high schools, academies, preparatory schools of other colleges and universities, or from military schools, accredited by the University.

The candidate for admission by certificate must present either a certificate of graduation from an accredited preparatory school, or a letter from the principal of such school recommending him for admission without graduation. The certificate should be signed by the principal or other executive officer of the school. Blank certificates will be sent by the Registrar of the University about May 1 of each year to the principal of each accredited school. The certificates of all expecting to enter the College of the University should be filled out, signed and returned by the principal or other officer to the Registrar before June 1. The accredited list is the same for all schools of the University.

Blank certificates will be sent on application to the Registrar.

ENTRANCE UNIT. Preparatory work is estimated in terms of the "entrance unit." A subject (like algebra, for example) running one year—*i. e.*, thirty-five weeks, five recitations per week, with at least forty minutes for each recitation—constitutes one

"entrance unit." In computing entrance units, the laboratory period should be twice the length of a recitation period.

Fifteen units are necessary for unconditional admission to the College. A temporary deficiency, however, of not more than three units will be permitted, but the deficiency in any "group" given below must not exceed one unit. A student thus conditioned must make good all of his deficiencies during his first year in the University. Deficiencies thus made good do not count as College work.

**MAKING UP DEFICIENCIES.** In making up deficiencies at the University, a "College unit"—i. e., five hours a week for a half-year (one term)—is considered equivalent to an "entrance" (or high-school) "unit," as above defined.

College credit for work done in preparatory schools will be given upon examination only.

### Subjects for Admission.

The subjects from which entrance work may be offered, together with the number of units, are arranged in six groups, as follows; a total of fifteen units must be offered:

GROUP I, English.	{ English, four units.	{ Three units are re- quired.
GROUP II, Mathe- matics.	{ Elementary algebra, one and one-half units. Plane geometry, one unit. Solid geometry, one-half unit. Plane trigonometry, one-half unit. Advanced algebra, one-half unit.	{ The elementary alge- bra and plane ge- ometry are required.
GROUP III, Foreign Languages	{ Latin, four units. Greek, three units. German, three units. French, three units.	{ Of these, three units are required, which must be, first, in Latin, or, second, in German.
GROUP IV, Physical Sciences.	{ Physical geography, one unit. Physics, one unit. Chemistry, one unit.	{ One unit is required.
GROUP V, Biological Sciences.	{ Botany, one unit. Zoology, one unit.	{ One unit is required.
GROUP VI, History.	{ Greek and Roman, one unit. Medieval and modern, one unit. English, one unit. American, one unit. Economics, one unit.	{ One unit is required.

As observed above, to secure unconditional admission to the

Freshman class of the College, the candidate must offer fifteen units from the foregoing list of accredited preparatory subjects. Of these fifteen units, eleven and one-half are prescribed by group; the remaining three and one-half units may be chosen without restriction.

In view of the difficulty some preparatory schools may have in expanding their courses of study so as to include all the required units, until further notice, candidates will be admitted unconditionally who offer fifteen units from the foregoing list, only eight and one-half units of which number are specifically required. These required subjects are, three units of English, three units of foreign language, two and one-half units of mathematics.

Students who take advantage of this privilege of postponing prescribed entrance requirements must make good such deferred requirements during their first year in the College. A course so taken during the Freshman year not only satisfies the entrance requirements, but also counts as regular College work.

It is hoped that within a reasonable time all Kansas high schools will be able so to arrange their courses of study as to meet all the entrance requirements of the University.

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## **School of Engineering.**

Professor FRANK O. MARVIN, A. M., Dean.

### **Admission.**

There are two methods of admission to the School of Engineering of the University: First, by examination; second, by certificate.

The conditions for entering by examination are the same as those of the College.

Nearly all students enter the School of Engineering by certificate from high schools, academies, preparatory schools of other colleges and universities, or from military schools, accredited by the University. The candidate for admission by certificate must present either a certificate or other credential, as noted in connection with admission to the College. The same rules apply in regard to admission by certificate to the School of Engineering as apply for admission to the College.

All deficiencies must be made good within such time as may be fixed in each individual case by the Dean of the School of Engineering.

Applicants for admission are advised to come without deficiencies, and to be especially well prepared in algebra and geometry.

### Subjects for Admission.

Fifteen units are required for admission.

REQUIRED.		OPTIONAL.	
Mathematics 1, 2, 3, algebra and plane and solid geometry	3 units.	Latin 1, 2, 3,	3 units.
English 1, 2, 3,	3 "	German 1, 2, 3,	3 "
Physics	1 "	French 1, 2, 3,	3 "
Free-hand drawing	1 "	Greek and Roman history	1 "
Foreign language — may be French or German or Latin; 3 units of one, or 2 units of any one and 1 unit of any other,	3 "	English history	1 "
		American history	1 "
		Chemistry	1 "
		Higher algebra and plane trigonometry	1 "
		Physical geography	1 "
		Botany	1 "
		Zoology	1 "
		Economics	1 "
		Manual training	1 "

Required, 11 units.

Optional, 4 units.

Total, 15 units.

Four units must be chosen from the optional list.

For any advanced rank, the applicant must have completed all of the studies of the course below the rank for which he applies, including the entrance requirements or their substantial equivalent, as determined by the committee on advanced standing. Applications for credits in single subjects will also be passed upon by this committee.

**SPECIAL STUDENTS.** Opportunity is given in the School of Engineering for the admission of persons of mature years who desire to pursue some special line of work, without following any prescribed course or becoming candidates for a degree. The admission of such special students is directly under the control of the Dean of the School of Engineering, whose certificate of acceptance must be presented to the Registrar before registration. Applicants for standing as special students must present satisfactory evidence of proper preparation for the studies desired and must also meet other requirements as fixed by the Faculty. Special students are subject to the same regulations as regular students with regard to the quality of work performed and attendance at recitations and examinations, but not as to number of studies to be pursued.

**INADEQUATE PREPARATION.** When students show by their current work insufficient entrance preparation in any study, they may be required to make good such deficiency in any manner prescribed by their instructors.

## **School of Law.**

Professor JAMES W. GREEN, A. M., Dean.

### **Admission.**

For entrance to the School of Law, candidates are required to offer fifteen units of work, which must be selected from the six groups prescribed for entrance to the College. The conditions for admission by certificate are the same as those in the College.

Candidates for admission to the Junior class of the School of Law, who cannot bring certificates, are required to be examined in all the subjects required for entrance, and the time and place of examination are the same as in the College.

Persons who have privately completed a part of the course are admitted to advanced standing in the Junior and Middle classes on satisfying the Faculty as to their qualifications. No one will be so admitted to the Senior class except upon passing a satisfactory examination upon the requirements for admission, and also upon the work prescribed for the Junior and Middle classes.

Certificates of work done in other law schools of recognized standing and equivalent requirements may be received in lieu of examinations for advanced standing.

**SPECIAL STUDENTS.** Opportunity is given in the School of Law for the admission of persons of mature years who desire to pursue special work, without following any prescribed course or becoming candidates for a degree. The admission of such special students is directly under the control of the Dean of the School, whose certificate of acceptance must be presented to the Registrar before registration. Applicants for standing as special students must present satisfactory evidence of proper preparation for the studies desired and must also meet other requirements as fixed by the Faculty. Special students are subject to the same regulations as regular students with regard to the quality of work performed and attendance at recitations and examinations.

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## **School of Medicine.**

Professor CLARENCE E. MCCLUNG, Ph. D., Acting Dean.

### **Admission.**

The standard of entrance to the medical course will be graduation from a four-year high-school course, with such conditions as are now allowed for entrance to the College.

There are two methods of admission: First, by examination; second, by certificate.

**BY EXAMINATION.** Students who cannot present certificates from accredited schools will be examined in the subjects required for admission, indicated under the College of Liberal Arts and Sciences. Subjects upon which the candidate will be examined are the same as those required for admission to the College.

**BY CERTIFICATE.** Nearly all students enter the School of Medicine on certificates from high schools, academies, and other preparatory schools. The method of accrediting by certificate is the same as that in the College. Graduates of state normal schools or of high schools or academies outside of the state of Kansas, whose credits are accepted by another state university, may be admitted under the same condition.

**UNITS REQUIRED.** The time value of each study is stated in units, a unit meaning one high-school study pursued daily for at least thirty-five weeks. A total of fifteen units is required for entrance. A student may be conditioned in not more than three units.

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## **School of Pharmacy.**

Professor LUCIUS E. SAYRE, Ph. M., Dean.

### **Admission.**

There are two methods of admission to the School of Pharmacy: First, by examination; second, by certificate.

Candidates may enter the School of Pharmacy on certificates from any of the accredited high schools. The plan of entrance by certificate is noted under The College.

Candidates for admission to the two-year and three-year courses must present certificates of graduation from accredited schools, or, in lieu of this, must present certificate covering work equal to that covered by graduation from the eighth grade of a grammar school in arithmetic, United States history, geography, English grammar, and civil government, and, in addition, either be examined in, or present certificates from high schools, academies or colleges for, physics, Carhart and Chute, or equivalent, and Latin, Bennett's Latin Grammar, or equivalent. These latter subjects, in which the student may be deficient, may be made up during the first year of attendance, either in a special class or at the Lawrence high school.

Candidates for admission to the four-year course must conform, by examination or certificate, to the requirements for entrance to the Freshman year of the College.

**SPECIAL STUDENTS,** not candidates for a degree, may be admitted to the School of Pharmacy without conforming to the requirements for entrance. The admission of such students is under the control of the Dean, and his certificate of recommendation must be procured before the candidate presents himself to the Registrar.

## Entrance Requirements Defined.

### LATIN. *Four units.*

Either three or four of the following units may be offered:

1. The Beginner's Book.
2. Four Books of Cæsar and Latin prose composition.
3. Six orations of Cicero and Latin prose composition.
4. Six books of Vergil's Æneid and Latin prose composition.

A full year must be given to each of these units. No credit is given for one or two units, unless the deficiency is made good after the student enters the University. If three units are offered, it is preferred that they be 1, 2, and 3; but 1, 2 and 4 will be accepted. No combination of Cicero and Vergil will be accepted as one unit.

THE BEGINNER'S BOOK. The all-important thing in the first year is that the pupil shall acquire a perfect knowledge of the forms of declension and conjugation. This means the ability not merely to repeat the paradigms correctly, easily, and rapidly, but to recognize instantly and certainly each case and verb form when met in isolation. Vocabulary and syntax are important, too, but they can be learned in later years, while a pupil who gets through the first year without learning the forms has little prospect of ever learning them. And no pupil who has to stop and think out or look up the identity of the forms he meets in his reading can ever read easily. There is only one way to teach this command of forms, namely, drill—drill at the first occurrence of a paradigm, drill in the regular reviews, drill at unexpected times all through the year. The teacher who cannot stand the drudgery of drills ought not to teach beginning Latin. Analysis into stems and endings may help some pupils a little, but it cannot take the place of thorough drilling. Besides the frequent repetition of paradigms, there must be many exercises in the recognition of isolated forms, given either orally or on the board. No beginner's book gives more of these exercises than are sufficient to serve as models.

In the first year the pronunciation is fixed, and it is as easy to fix the right one as a wrong one. The Roman method is of course the only one possible at present. A perfectly accurate pronunciation requires that long vowels be given twice the time given to short vowels, whether accented or not. This is contrary to English usage, and, for this reason, is so difficult that few teachers attempt it. But it is very easy to distinguish in quality between long and short vowels, especially as most preparatory books indicate the quanti-

ties; and there can be no possible excuse for permitting incorrect accents. Requiring pupils to mark the long vowels in all written work is helpful, but will have no effect if they hear and use an incorrect pronunciation. The teacher should spare no pains in perfecting his own pronunciation; and he should always read to the class the Latin words in the next day's lesson, and make sure that every pupil knows the correct pronunciation of every word before he learns it.

A good feature of the book adopted for use in the high schools of this state is the connected passages of easy Latin scattered through the book as reading lessons. Under no circumstances should these be omitted. The transition from a beginner's book to Cæsar is difficult at best, and all the more so if the pupil has read no connected Latin in his first year.

CÆSAR. If the work of the first year has been done well, Cæsar is not too difficult an author to follow the beginner's book immediately. If Cæsar is read intelligently, he is very far from being too dull and monotonous for a year's work. Under these conditions, it is best to read, without substitution, four books of Cæsar, or selections from the entire seven books equivalent in amount to the first four. Books V-VII are more interesting than books I-IV, and the teacher who is weary of I-IV may well omit portions of them, especially I, 30-55, and substitute portions of the later books, as V, 1-24; V, 24-52; VI, 11-28; VII, 66-90. But if the teacher desires to make a partial substitution of some other author, the University will accept in place of one book of Cæsar an equivalent amount of *Viri Romæ* or *Nepos*. Any of the second-year books offer an acceptable substitute for Cæsar to schools which are not bound by the action of the Text-book Commission.

At the end of the second year the pupil should have an accurate working knowledge of all the common uses of the cases and modes. Therefore it is unavoidable that a drill on syntactical constructions should receive the chief attention during the reading of Cæsar. But if Latin prose composition is properly emphasized it will carry a large part of this burden, and will leave the class some time for getting at the contents of Cæsar's story. It is a great mistake to make nothing but a grammatical drill-book out of Cæsar.

The teacher will find it helpful to keep on his desk one of the several good editions of Cæsar. Perhaps Allen and Greenough is the best for this purpose.

CICERO. The six orations should include the four against Catiline and the one for the Manilian Law. The one for the Poet Archias may be recommended as the sixth. If a partial substitution is desired, Sallust's Catiline may be read instead of the Manilian Law

and the sixth oration. This gives variety in the year's work and makes the setting to the Catiline speeches more vivid.

The syntactical drill cannot yet be subordinated, but it ought not to require so much time as during the second year. Pupils should make written abstracts of the speeches, so that they may get the contents of each as a whole; should be encouraged to read the Latin aloud with rhetorical emphasis; and should in every possible way be led to appreciate the fact that they are reading great speeches, not disconnected pages of Latin sentences.

VERGIL. If the pupil has come up to the study of Vergil without a good working knowledge of declension and conjugation forms and of case and mode uses, he is to be pitied. There ought to be too much to do to permit of much grammatical drill. This is the reason why Vergil ought always to follow Cicero in the course, not precede. Opinions may differ as to whether pupils find Cicero or Vergil the more difficult, although a comparison of scholarly editions will prove that editors at least find Vergil vastly the more difficult. But while reading Cicero any teacher can find plenty of time for grammatical drill; while reading Vergil he ought not to be able to do so. And in his third year of Latin a pupil must have grammatical drill. If read in the fourth year, grammatical drill may be confined almost wholly to the period devoted to Latin prose composition.

First and foremost, the pupil should get the contents of the story. Fortunately few teachers fail to let their pupils do this in Vergil, however they may treat Cæsar and Cicero. Yet, an occasional college student will say that he does not know whether or not he has read the story of Æneas's descent to the lower world. Secondly, the pupil must learn to read Vergil metrically. This does not mean that he should be taught painfully to divide the lines into feet, giving a reason for each step, and then be left to imagine that he has thus "scanned" Vergil. He should be taught to read the lines as smoothly and intelligently as so much English poetry; and this is no difficult feat. Only then will he feel that Vergil wrote poetry. It is not necessary to learn all the rules of quantity laid down in the grammars. If he has been taught to discriminate between long and short vowels in his usual pronunciation he will have no trouble at all. If not, *Auxilia Vergiliana*, a little pamphlet published by Ginn & Co., shows how a few rules, well used, will carry him through almost all lines; and an occasional reference to the vocabulary will clear up the rest. If the teacher is a convert in theory to the doctrines of Hale (as the writer is) or of Bennett, let him nevertheless begin by teaching the old-fashioned way, with an ictus on the first syllable of each foot, and no word accent. Few pupils will make music of Vergil's verse on

any other plan. Thirdly, the pupils ought to learn a good deal of mythology—not theories about the origin and meanings of the gods, but the stories which form so integral a part of much of our English literature. In addition to these main topics, there are innumerable questions on matters literary and archæological which will occur to the teacher who knows the literature of his subject. Many of these will serve to interest and stimulate the pupil.

The teacher will find help in a desk copy of Knapp (Scott, Foresman & Co.) or Greenough and Kittridge (Ginn & Co.)

**LATIN PROSE COMPOSITION.** Although the goal in the study of Latin is the ability to read, rather than to write, the language, yet accurate reading is impossible without a good command of vocabulary, form, and syntax; and this can be acquired by no other method so surely and quickly as by the writing of Latin.

No manual of prose composition has been adopted by the Text-book Commission, and the teacher may therefore choose the one best adapted to his needs. There are two systems in vogue. Such books as Jones's Exercises in Latin Prose Composition (Scott, Foresman & Co.) and Bennett's Latin Composition (Allyn & Bacon) take up the principles of syntax in logical order, as they are given in the grammars, and give sentences which call for the practical use of these principles. Their chief purpose is to insure a systematic study and comprehension of the syntactical portion of the grammar. Such books as Daniell's New Latin Composition (Sanborn & Co.) and Moulton's Preparatory Latin Composition (Ginn & Co.) base their exercises closely on the text of Cæsar and Cicero, so that the pupil uses the words and constructions found in the portion of the text just read. Their chief merits are that they give practice in writing connected passages as well as disconnected sentences, and they encourage the pupil to study closely the text he is reading. But these merits seem outweighed by the fact that they are necessarily less systematic in presenting the principles of syntax, although Daniell's attempts with some success to remedy this defect. If a specific recommendation is desired, our preference would be for the whole of Bennett, supplemented, if possible, by frequent exercises dictated from Daniell. This amount is not too large for the best interests of the pupil, since the more composition is emphasized the less needful it is to make mere grammatical drill-books of the Latin authors.

The requirement of the University is that the equivalent of one period a week be given to composition throughout the second, third and fourth years. Individual experience must determine how this shall be divided. The most usual method, and perhaps the best, is to give it one period a week. Sometimes it is scattered out, so

that a little is done every day; but this is likely to make the work too scrappy and to lead to its neglect. A few teachers spend several weeks together on composition alone, usually at the end of the year, and justify the plan on the ground that it interests the pupils more. This is no doubt true. The dislike felt by most pupils for composition is largely or wholly due to the fact that they do so little of it that it never becomes easy. But it must be remembered that composition is practiced as an aid to reading, and this aid is lost unless the reading is carried on side by side with the writing.

If such a book as Daniell's is used, the exercise assigned should always be the one based on the portion of the text just read by the class, even if some exercises have to be omitted. To let the writing lag far behind the reading defeats the purpose of the method.

TRANSLATION. If translation is done well it is a better training in English expression than can be obtained from original composition on the part of the pupil; for in original composition he can usually avoid expressing at all any idea which he cannot express easily, while in translation he is forced to give expression to every idea of his author. There is therefore a sad waste of opportunity if the teacher allows himself to be satisfied with slipshod, slovenly translation. Yet the mistake is prevalent, for "translation English" has become a synonym for a certain kind of language which is never heard outside of the classroom except for humorous effect. It consists in part merely of the overworking of some very good words and phrases. A modern general might sometimes urge or encourage his men: Cæsar always exhorted his. We sometimes cannot do things: the ancients were always unable to do them. A worse feature of "translation English" consists of so-called "literal translations" of Latin idioms. Some teachers even require such renderings, although monstrosities like "he said himself to be about to go" are not English at all, and therefore are not translations. A good classroom translation must be good English, and should at the same time show the disposition made of each word of the original. If one quality must be sacrificed let it be the latter, and let the teacher satisfy himself by questions that the pupil understands the Latin. But the pupil cannot always make a good translation unaided, even if he understands the Latin. This is the best reason for invariably reading the review lesson. On the advance lesson he must be expected to stumble and must be helped. But on the next day he should be required to read through the lesson as smoothly and as perfectly as if he were reading so much English.

Too many teachers unconsciously have the habit of correcting translation by interjecting words and remarks while the pupil reads. If the pupil has prepared what he considers a good translation, this

practice both irritates and discourages him. If he has not, it encourages him to prepare his translation in a slipshod way, trusting to hints from the teacher to carry him through. In either case, neither the pupil who recites nor the rest of the class can fit the teacher's suggestions into the pupil's translation. The pupil should always be allowed to read through, without suggestion, the portion assigned him, whether a sentence or a paragraph. The teacher should then comment on his mistakes, and finally should translate the whole properly.

**SUBJECT-MATTER.** A very common and very unfortunate defect in teaching is a failure to make sure that the pupil gets a good understanding of the subject-matter of the Latin authors. To take Cæsar, for example. Many pupils, many teachers even, find him dull and monotonous. No person could ever hold this opinion if he knew just what Cæsar did in each of his campaigns, and had taken the pains to study out his routes, his battle-fields, his methods, and his motives. But no history ever written would be interesting if read at the rate of half a page a day and studied solely from the point of view of his syntax. The language of Cæsar must be the main object of attention; but the pupil ought to know the story as he reads it, ought to appreciate the bearing of every new chapter on the whole, ought to trace out all the movements on the map. The failure to get such an understanding makes the author dull, makes it harder to secure an adequate translation of the passages assigned for the daily lessons, and leaves the pupil at the end of his year's work with no comprehension that he has been reading one of the world's great classics. If the average teacher feels satisfied that his pupils are getting such a knowledge of the subject-matter of the authors they are reading, he can easily test his results by an examination question. At the end of any book of Cæsar let him ask his class, without previous warning, to write out a narrative of the campaign. To judge by what most college students remember of the contents of the preparatory authors, he will be surprised at the answers, if he gets any.

The surest and best method of giving pupils this knowledge of the subject-matter is requiring them to write out in note-books brief summaries of each day's lesson, as a part of the next day's work. This should be supplemented by brief discussions, and by questions during the daily recitations and in examinations. It goes without saying that the teacher himself must have a full comprehension of the subject-matter; and this he certainly will not have unless he makes a practice of reading at a sitting a whole campaign of Cæsar, a whole oration of Cicero, or a whole book of Vergil. He will be

much helped, too, by reading one or more of the books which are mentioned later.

**SIGHT-READING.** Sight-reading has its value, though it has been overestimated. It is not worth doing at the expense of other things; but if there are a few minutes to spare at the end of the recitation, they may be well employed by letting the class read on into the next day's lesson without using either notes or vocabulary. This is better than taking Latin from some other source, because what is learned is fixed in the memory when the pupils read the passage again in preparation for the next day's recitation, and because it insures the attention of the whole class.

**BOOKS.** The following list contains a few of the books which, in our judgment, will be found most useful in the library of the high school or the teacher; the prices are quoted from the Publishers' Trade List Annual:

#### CÆSAR.

Holmes, Cæsar's Conquest of Gaul, Macmillan & Co., \$6.50. The best discussion of the military and geographical problems in Cæsar.

Fowler, Julius Cæsar, G. P. Putnam's Sons, \$1.50. Perhaps the best life of Cæsar.

Judson, Cæsar's Army, Ginn & Co., \$1.

#### CICERO.

Boissier, Cicero and his Friends, G. P. Putnam's Sons, \$1.75.

Forsyth, Life of Cicero, Charles Scribner's Sons, \$2.50.

#### VERGIL.

Conington, Vergil, Macmillan & Co., 3 vols., each \$3.25. The best English edition. Volume II contains Æneid I-VI.

Conington, Vergil's Poems in Prose, Longmans, Green & Co., \$2.

Dryden, Translation, several editions.

Sellar, Vergil, Oxford Press, \$2.25. The best literary criticism.

#### GRAMMARS.

The teacher should have all the grammars commonly referred to, and especially Harkness, Complete Latin Grammar (1898), as a corrective to the 1881 edition adopted for use in the state.

#### LEXICONS.

Harpers' Latin Dictionary, American Book Company, \$6.50.

Lewis, Elementary Latin Dictionary, American Book Company, \$2.

White, English-Latin Dictionary, Ginn & Co., \$1.50.

#### DICTIONARIES OF ANTIQUITIES.

Harpers' Dictionary of Classical Literature and Antiquities, American Book Company, \$6 to \$10.

Seyffert, Dictionary of Classical Antiquities, Macmillan & Co., \$2.25.

One or the other of these books is almost indispensable.

#### ATLASES.

Ginn's Classical Atlas, Ginn & Co., \$1.25 to \$2.

Kiepert, Atlas Antiquus, Sanborn & Co., \$2.50.

Sanborn's Classical Atlas, Sanborn & Co., \$1 to \$1.75.

#### WALL MAPS.

Kiepert, get price-list from Rand, McNally & Co. The best and most expensive. Cheaper maps are advertised by the Boston School Supply Company, but the department has not examined them.

#### HISTORY.

(See the department of history.)

#### HISTORIES OF LITERATURE.

Cruttwell, History of Roman Literature, Charles Scribner's Sons, \$2.50.

Mackail, Latin Literature, Charles Scribner's Sons, \$1.25. This is itself a work of literature.

#### MYTHOLOGY.

Gayley, Classic Myths in English Literature, Ginn & Co., \$1.50.

Guerber, Myths of Greece and Rome, American Book Company, \$1.50.

#### MISCELLANEOUS.

Bennett and Bristol, The Teaching of Latin and Greek, Longmans, Green & Co., \$1.50.

Hale, Art of Reading Latin, Ginn & Co., 25 cents.

Johnston, Private Life of the Romans, Scott, Foresman & Co., \$1.50.

Johnston, Teaching of Second-year Latin, Scott, Foresman & Co., free.

#### GREEK. *Three units.*

1. Elementary Greek. Gleason's Greek Primer or White's First Greek Book, or an equivalent. Thorough mastery of declensions and conjugations, and the main ideas of syntax. Xenophon's Anabasis begun, and twenty to thirty pages read. Goodwin's, Babbitt's or Goodell's Greek Grammar.

2. Xenophon's Anabasis continued into or through the fourth book, or an equivalent amount of other Attic prose. Review of inflections. Systematic study of syntax in the grammar. Practice in writing Greek based on the text read. Constant training in sight-reading.

3. Homer's Iliad or Odyssey, five to six books, exclusive of the Catalogue of Ships. Special attention to Homeric forms, vocabulary, and scansion. Constant practice in reading at sight. Seymour's School Iliad or Benner's Selections from Homer's Iliad. Perrin & Seymour's School Odyssey (edition with eight books). Attic prose composition once a week. Bonner's Greek Composition for schools.

#### SUGGESTIONS TO TEACHERS.

Special attention should be paid to the regular forms and constructions, the most common words and phrases and principles, leaving the irregular or uncommon to be learned when they occur in reading. Require a firm grasp of the essentials. Review and repeat, but not to weariness. Go slowly at first, yet aim to get results as fast as possible.

Help students to acquire a vocabulary, by grouping words when possible, by bringing out the English derivatives, by having them mark in both text and grammar words or principles especially to be learned, and then review them often. Don't allow a student to turn to his lexicon or grammar to look up a word or principle until he is sure that it is necessary. Have him, if possible, originate some device of his own to remember the meanings of words.

Go over as much as possible of the advance lesson each day. Have students pronounce and translate at sight; watch and teach or guide them how to read, leading them to bring forth and apply meanings of words and forms and principles of syntax they have already had and know. Explain as much as necessary, but leave something for them to do.

Have students translate the words of a sentence in the order in which they stand in the original, and make good English afterwards. In reading poetry let them use a poetic order.

Use the blackboard much; let the students see what is necessary.

Yet train the ear also. Have some oral work every day. Have students pronounce aloud, and let them translate some from hearing, especially passages already translated from the book. If possible, introduce some conversational exercises, and have students learn some Greek by heart.

Require a knowledge of the geography, history and mythology needed to understand the author being read, and something of his life, time, and words.

A few books that ought to be at command of students and teachers:

Lord's Classical Atlas, Boston, Sanborn, \$1 to 1.75.

Botsford's History of Greece, New York, Macmillan, \$1.10.

Bury's History of Greece, New York, Macmillan, \$1.90.

Pennell's Ancient Greece, Boston, Allyn & Bacon, 60 cents.

Butler's Story of Athens, New York, Century Company, \$2.40.

Jebb's Primer of Greek Literature, New York, Appleton, 40 cents.

Capp's Homer to Theocritus (a history of Greek literature), New York, Scribners, \$1.50.

Jebb's Homer, and Introduction to the Iliad and Odyssey, Boston, Ginn, \$1.12.

Goodell's The Greek in English, New York, Holt, 60 cents.

Gulick's Life of the Ancient Greeks, New York, Appleton, \$1.40.

Harpers' Dictionary of Classical Literature and Antiquities, New York, Harpers, \$6 to \$10.

Liddell and Scott's Greek Lexicon, New York, American Book Company, \$10.

Hill's Illustrations to School Classics, New York, Macmillan, \$2.50.

Tarbell's History of Greek Art, New York, Macmillan, \$1.

Schuchhardt's Schliemann's Excavations, New York, Macmillan, \$4.

Tsoudas and Manatt's Mycenæan Age, New York, Houghton, Mifflin & Co., \$6.

Mycenæan Troy, Tolman and Scoggin, New York, American Book Company, \$1.

Weissenborn's Homeric Life, New York, American Book Company, \$1.

Leaf and Bayfield's Iliad, with notes, New York, Macmillan, 2 vols., each \$1.40.

Moss's First Greek Reader, new edition, Boston, Allyn & Bacon, 70 cents.

Dickinson's Greek View of Life, London, Methuen, \$1.

## GERMAN. *A three years' course.*

### FIRST YEAR.

TEXT-BOOKS SUGGESTED.\* Carruth's Otis's German Grammar, Henry Holt & Co., New York (supplemented if desired by further

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\*The books recently adopted by the School Text-book Commission serve only for a part of the first two years. Unfortunately the law was not drawn with a view to two- and three-year courses, and accordingly the commission has adopted a book of exercises but no reader. Practically, every teacher of German uses a grammar and a reader in the first year. Accordingly, the course here recommended introduces the state text in grammar, makes a place for the exercise book for those who use such in addition, and outlines the work in a reader. The detailed programs of work are given only for the benefit of new teachers, though they may be found helpful to all. Of course, experienced teachers will adapt any such plan to the needs of individuals and classes. In any case, it is wise to explain in advance to the class the purpose of the work, the method to be pursued, and the general distribution of it.

exercises in Becker's Elements of German, Scott, Foresman & Co., Chicago), and Carruth's German Reader, Ginn & Co., Boston.

OBJECTS OF FIRST YEAR'S WORK. (1) To obtain a thorough knowledge of elementary grammar with practical application to the printed and spoken language; (2) to obtain a good German pronunciation and ability to use German script with accuracy and moderate ease; (3) to acquire familiarity with a limited German vocabulary as employed both in standard German prose and in ordinary conversation; (4) to begin an acquaintance with good German literature and with German popular songs; (5) to learn to carry on conversation in very simple German on every-day topics.

DISTRIBUTION OF THE WORK. There should be a German recitation every school-day of the thirty-four working weeks of the school year. These 170 recitation periods may wisely be distributed as follows:

Introductory (talk about the language, illustrations, introducing phrases for conducting recitation in German, pronunciation, etc., lesson I of the grammar) ..	5	periods.
Grammar ( twenty-three lessons, two periods to each) ..	46	"
Review of grammar .....	20	"
Reader (sixty pages, from one-half page daily to two pages daily, including review) .....	44	"
Exercises (in reader or in state text, or both, including reviews) .....	28	"
Dictations and learning songs .....	22	"
Final review .....	5	"
Total .....	170	periods.

#### PROGRAM OF THE WORK — FIRST TERM.

First week: Introduction (lesson I) .....	5	periods.
Second week to fifth, inclusive: Grammar, seven lessons (including VIII), fourteen recitations, with six more for review .....	20	"
Sixth week to seventeenth, inclusive: Grammar, three periods weekly first six weeks, two periods weekly last six weeks, to lesson XVIII, inclusive; twenty periods first time, ten on review .....	30	"
Reader, two periods weekly for twelve weeks, divided between reading and exercises on the reading, covering ten to twelve pages of Carruth's Reader .....	24	"
Dictations, one weekly, last six weeks .....	6	"
Total .....	85	periods.

CONDUCT OF LESSON II IN CARRUTH'S OTIS'S GRAMMAR. First recitation (after a week of introductory drill in pronunciation). Assign to and including the German exercise II (one-half or more), and in assigning read over slowly and carefully the model sentence, §2, and the words of the vocabulary. (This practice of reading the vocabulary should be kept up for the first eight lessons.) Ad-

monish class to read the German sentences over aloud in studying them.

*Recitation.*—Require the recitation of the model sentence from memory; be sure that the pupils understand the cases and their uses. Call for the statement of the grammatical facts included in the text of the lesson. Have the class recite the definite article, singly and in concert; have the declension given both downward and across; that is, by genders and by cases.

NOTE.—In connected speech the *e* of the article is slurred (see page 6 of the grammar), but in recitation of the forms the *e* should be pronounced distinctly, long before *m* and *n*, short before *r* and *s*.

The vocabulary may be read, or the German words required on giving the English; or, in case of the nouns, the pupils may be required to give the correct article with the noun when the teacher has spoken the noun alone. The class should recite the present tense of *sein* singly and in concert. The sentences of the German exercise should then be read by pupils in turn. The pupils may turn them into English, or simply be asked about the forms of the articles used, or both. In the first lessons, constant attention must be paid to pronunciation in reading the German sentences.

SECOND RECITATION ON LESSON II. Assign the writing, in German script, of one-half or slightly more of exercise 2, the preparation of continuations of the specimen sentences in conversation 1, the memorizing of the *Sprichwort* and the poem *Das Glueck*. In assigning the lesson these should be pronounced by the teacher. Also a review of the forms of the definite article and present tense of *sein*.

*Recitation.*—Send pupils to board to copy from their papers the sentences of exercise 2. When all are written, go over the sentences on the board and correct, asking class to suggest corrections and explaining, and requiring pupils to make corrections accordingly on their own papers. At close of recitation the teacher should take up these papers and correct them carefully, to return at the next recitation.

NOTE.—The teacher should take up and correct the papers himself for at least the first eight lessons. After that the class may be trusted to make its corrections in the class, but the papers should be taken up once a week throughout the first year.

Recite again, and have some of the pupils write on board, the definite article and the present tense of *sein*. Use conversation 1, the teacher asking the questions and requiring the pupils to reply, using the entire vocabulary to the conversation. Have the *Sprichwort* and the poem recited in concert. The second half of the exercises should be done in the review, together with renewed recitation of the grammatical forms.

LESSON III. Assign as in lesson II, through one-half of the German exercise for one recitation. In this recitation the exercises of lesson II are given back corrected.

The second recitation on lesson III will be assigned as on the second half of lesson II, but in addition the pupils are to be required to learn the now corrected sentences of exercise 2, to recite them in response to the reading of the English by the teacher. In learning these sentences the pupils should copy them as corrected into a permanent exercise book. The learning and memorizing of the corrected sentences is one of the most essential features of the lesson. Thus, in every second recitation there will come the correction of one English-German exercise and the recitation of the one preceding.

The most dispensable part of the recitation is the reciting of the words of the vocabulary. When a German song is to be learned and sung, as in lessons III, VII, and IX, the memorizing may be done in the second half of that lesson and the singing in the first half of the next lesson. The favorite songs should be sung frequently. There is no better means of rousing love for the language and fixing the vocabulary in the pupil's memory. Or the singing of the songs may take part of the period assigned to dictations.

FIRST READING LESSON. For the first reading lesson assign fourteen lines in Carruth's Reader. Read it over in German in assigning it. In recitation, have the pupil read the German sentence through first; correct him and have him read it again before translating. Translation should always be in good idiomatic English, and as nearly literal as this will permit. Do not permit a word-for-word translation except as necessary to explain a German idiom. By all means require translation. Reading without translation should not be encouraged the first year, unless it be with extra matter. Discourage marginal and interlinear notes.

*Exercises.*—The exercises connected with the reader may be taken up one at a time just after the reading of the corresponding section, or all those on a given extract may be taken in connected series, or they may be postponed until the completion of the work in the reader. Whether the exercises are taken from the reader or from Becker's Elements of German, they should be written and corrected and learned as prescribed for the exercises of the grammar. In the second term, however, the class may be occasionally tested for its ability to do an exercise orally without having written it previously. But, even then, the exercises should be written out afterwards. Writing makes an exact scholar. Neatness in writing should be insisted upon. Exercises should

have wide spacing and ample margins, to make room for corrections.

*Dictations.*—Dictations should consist of very simple German. A sentence should be read through twice, once very slowly and then at normal rate, and the pupil should be expected to fix the sentence as thus read. If the sentence is complex, the teacher will have to repeat the clauses in order. Dictations should be handed in for inspection and correction. Occasionally the pupils should be required to read aloud from their own manuscripts.

#### DISTRIBUTION OF THE WORK—SECOND TERM, FIRST YEAR.

Grammar (six lessons of Carruth's Otis, XIX to XXIV, including review).....	16	periods.
Reader (forty-eight to sixty pages, through <i>Der zerbrochene Krug</i> in Carruth's Reader).....	32	"
Exercises (completing XXXVI in Carruth's Reader) ..	16	"
Dictations and songs.....	16	"
Review.....	5	"
Total.....	85	periods.

#### PROGRAM OF THE WORK—SECOND TERM, FIRST YEAR.

Reader, two periods weekly, sixteen weeks.....	32	periods.
Grammar, one period weekly, sixteen weeks.....	16	"
Exercises, one period weekly, sixteen weeks.....	16	"
Dictations and songs, one period weekly, sixteen weeks,	16	"
Review, one week solid.....	5	"
Total.....	85	periods.

#### SECOND YEAR.

**TEXTS.** Carruth's Otis's Grammar; Carruth's Reader; Wilhelm Tell, Carruth's edition, Macmillan & Co., New York, or Palmer's edition, Holt & Co., New York, or Deering's edition, Heath & Co., Boston; for sight-reading: Hauff's *Der Zwerg Nase* (38 pp.), C. H. Kilborn, Boston, or Ebner-Eschenbach's *Krambambuli* (47 pp.), American Book Company, Chicago.

**WORK TO BE ACCOMPLISHED.** Review and completion of grammar; reading about 225 pages, with some composition exercises; practice in sight-reading.

#### DISTRIBUTION OF THE WORK—SECOND YEAR.

Review of grammar (lessons II to XXIV).....	16	periods.
Completing grammar (lessons XXV to XXX).....	16	"
Completing reader, forty-five pages of prose and fifteen pages of verse, selected.....	32	"
Composition exercises on the same.....	16	"
Wilhelm Tell, complete, with review.....	64	"
Sight-reading.....	16	"
Final review.....	10	"
Total.....	170	periods.

## PROGRAM OF THE WORK—FIRST TERM, SECOND YEAR.

Completion of grammar, one period weekly for sixteen weeks.....	16 periods.
Completion of reader, three periods weekly for eleven weeks, continuing with Wilhelm Tell, act I, five weeks.....	48 “
Composition exercises on reader, etc., one period weekly for sixteen weeks.....	16 “
General review, one week solid.....	5 “
Total.....	85 periods.

## PROGRAM OF THE WORK—SECOND TERM, SECOND YEAR.

Review of grammar, one period weekly, sixteen weeks..	16 periods.
Completion of Wilhelm Tell, three periods weekly for sixteen weeks.....	48 “
Sight-reading, one period weekly for sixteen weeks..	16 “
General review, one week solid.....	5 “
Total.....	85 periods.

NOTE.—The Committee of Twelve recommends Wilhelm Tell for the intermediate course, or third year, of high-school work. For schools having a three-year course it may be well to follow this recommendation and occupy the reading time of the second year with easy prose like that found in the reader. But high schools having only two years of German should by all means not deprive their pupils of the delight of reading this play, which invariably appeals to them.

## THIRD YEAR.

TEXTS. Freytag's *Die Journalisten*, ed. Thomas, Holt & Co., ed. Toy, Heath & Co. (about 135 pages); Fouque's *Undine*, ed. v. Jagemann, Holt & Co. (about 115 pages); Heine's *Reisebilder*, ed. Van Daell, Heath & Co., ed. Burnett, Holt & Co., ed. Gregor, Ginn & Co. (about 90 pages); Riehl's *Burg Neideck*, ed. Wilson, Ginn & Co. (57 pages); Rosegger's *Waldschulmeister*, ed. Fossler, Holt & Co. (about 125 pages); Heyse's *Die Blinden*, ed. Carruth and Engel, Holt & Co.; Schiller's *Balladen*, ed. Johnson, Heath & Co. (about 90 pages). Out of these a good selection would be: Freytag's *Die Journalisten*, Schiller's *Balladen*, and any one of the other books listed. If one of the longer ones, a portion may be read at sight.

WORK TO BE ACCOMPLISHED. Reading and careful translation of about 300 pages of prose and verse, with composition and conversation exercises thereon, and drill in more difficult features of grammar as illustrated by the text.

DISTRIBUTION OF THE WORK. A class should read from two to three pages daily, the lesser amount when more time is given to exercises on the text and to grammar review. Exceptional classes may be able to read 400 pages in the third year. In view of the minuteness with which programs for the earlier years have been given, it seems unnecessary to make such programs for the third year.

FRENCH. *One, two or three units.*

FIRST UNIT. The elements of grammar (Fraser and Squair's French Grammar), all of part I and the irregular verbs in part II; or Grandgent's Essentials of French Grammar, through the irregular verbs; or Van Daell's Introduction to the French Language, the first sixteen chapters.

Great stress should be laid on pronunciation, the quality of the vowels, syllabication. To fix these principles and connect sound with spelling, brief exercises in dictation, occupying only five or ten minutes, should be introduced after the first few weeks.

As the grammars named above all offer reading material, the reader proper need not be introduced before the seventh or eighth week, at first but one or two lessons a week, then with increasing frequency as the elementary facts of the language are mastered.

This reading should cover not less than 100 pages of simple French (as in Super's Reader), and should serve a threefold purpose: Translation into good English, practice in reading aloud of French, and illustration (and hence review) of the grammatical principles set out in the rules and applied in the written exercises.

SECOND UNIT. Completion of all the lessons in the above-mentioned grammars, with suitable written exercises at least once a week. In this manner the pupil will by the end of this period have mastered all the essentials of accidence and syntax. The reading should contribute to this end; in particular, the use of modes and tenses should be repeatedly dwelt upon in connection with the reading.

More emphasis is now to be placed on dictation, and on the speaking by teacher and pupils of simple French sentences based on their reading, the teacher sometimes also reading aloud in French for translation by the pupils. The reading should comprise from 300 to 350 pages, which may be taken from the latter part of the reader and from such texts as Malot's *Sans Famille*, Daudet's *Selected Stories*, Erckmann-Chatrian's *Madame Therese*, Labiche's *le Voyage de M. Perrichon*, Sandeau's *Mademoiselle de la Seigliere*.

THIRD UNIT. Thorough review of grammar. Composition once a week, both formal grammar exercises and résumés and paraphrases of short portions of French stories.

Suitable composition books are: Bouvet's French Syntax and Composition, and François's Advanced French Prose Composition.

Reading of 600 pages in such works as Mérimée's *Colomba*; A. France's *le Crime de Sylvestre Bonnard*; Pouvillon's *Petites Ames*; George Sand's *la Mare au diable*; Pailleron's *le Monde ou l'on s'ennuie*; Loti's *Pêcheur d'Islande*; Theuriet's *Bigarreau*; Coppée's *le Pater*.

Teachers of French are advised to consult the valuable Report of the Committee of Twelve of the Modern Language Association of America.

### PHYSICS. *One unit.*

While successful teaching of physics requires both text-book and laboratory work, the latter is the more important and at the same time is more often neglected. The laboratory work and text-book work must each supplement the other. Without the actual performing of experiments the text-book is almost meaningless and soon forgotten.

In handling any text the teacher should feel free to omit any parts which, with the laboratory facilities at hand, cannot be made perfectly clear. In every good text are found sets of problems. If these are sufficiently simple they are of great use in affording an opportunity to apply and therefore fix in mind the principles learned. When the problems prove difficult it is likely not on account of any deficiency in the student's mathematical training. The terms used—ergs, dynes, kilograms, etc.—are confusingly new. The thing to do is to supply exceedingly simple problems till the student becomes familiar with the new units.

The second essential of a course in physics, the experimental part, includes, first, a set of thirty-five to fifty experiments to be performed by the student; and second, a number of demonstrative experiments performed by the teacher in connection with the lecture or recitation. Just what experiments should be performed by the students and what should be left for classroom demonstration is often a hard question to decide. The rule that demonstrative experiments be qualitative and students' experiments quantitative is good, but has many exceptions.

EXPERIMENTS suitable for classroom demonstration are found in every text-book. For students' work, some such set of experiments as the following will be found useful:

1. Exercise in measuring lengths, areas, etc.
2. Measurement of volume by water displacement.
3. Laws of bending. Verify Hook's law for bending, stretching, etc.
4. Errors of spring balance. Find the corrections to be added to the readings of spring balances when used in a horizontal position.
5. Composition of forces. Find the resultant of two or more forces acting at the same point.
6. Parallel forces. Find the resultant of two parallel forces.
7. Simple pendulum. Find the effect of amplitude upon time of vibration.

8. Simple pendulum (continued). Find the law connecting length of pendulum and time of vibration.

9. Physical pendulum. Find the center of oscillation.

10. Levers. Find the law of equilibrium, the weight at fulcrum. (Compare with No. 6.)

11. Levers (continued). Find the center of gravity, and weight of a lever; also the mechanical advantage.

12. Inclined plane. Find the law of equilibrium of inclined plane, and the mechanical advantage.

13. Archimedes principle. Measure the lifting effect of a liquid on a body immersed in it, and also weight of the liquid displaced.

14. Density of solid. Find by weighing in water.

15. Density of a liquid. Two methods.

16. Law of flotation. Find weight of liquid displaced by a floating body and compare with weight of the body.

17. Vibration rate. Measure the vibration rate of a tuning-fork.

18. Wave length of sound. Measure the wave length of sound by use of the Y tubes and divided path.

19. Velocity of sound. Measure the velocity of sound.

20. Intensity of light. By the use of the photometer show that one candle gives the same illumination as four placed twice as far from a screen. Then, assuming the law of inverse squares, find the candle power of a lamp.

21. Plane mirror. Find the position of the image of a pin in a plane mirror.

22. Curved mirrors. Using a cylindrical mirror, find the position of the image of a pin formed by the central part of the mirror, then the image formed by the outer part of the mirror. (This will show spherical aberration.)

23. Index of refraction. Find the index of refraction of glass, using a piece of plate glass with two opposite edges ground.

24. Focal length of lens. Measure the focal length of a converging lens.

25. Images. Find the shape and size of real image formed by a lens; and compare with size of object, and distances of object and image from lens.

26. Virtual images. Study virtual images formed by lens, note where virtual images are located, and their position, whether inverted or erect; also determine whether or not the size of a virtual image, the size of the object, the distance of the image from the lens, and the distance of the object from the lens conforms to the same law as was found to hold for real images.

27. Fixed points of a thermometer. Find the freezing-point and the boiling-point and compare with those on the scale.

28. Coefficient of linear expansion of a solid. Measure the linear expansion of a solid and compute the coefficient.

29. Coefficient of cubical expansion of a liquid. Measure the expansion of turpentine or alcohol and compute the coefficient of cubical expansion.

30. Coefficient of cubical expansion of a gas. Measure similar to 29. Also verify Charles law.

31. Specific heat. Measure the specific heat of some solid.

32. Latent heat of fusion. Measure the heat of fusion of ice.

33. Heat of vaporization. Measure the heat of vaporization of water by condensing steam.

34. Dew-point. Find the dew-point.

35. Lines of force. Study and map on paper the lines of force in the field of a magnet. Trace also the effect (on those lines) of soft iron brought into the field.

36. Simple voltaic cell. Set up simple cell and observe local action. Amalgamate the zincs. Connect up again through a galvanometer, electric bell, or telegraph sounder, and leave till polarized.

37. Preventing polarization. Show the following ways of overcoming polarization: (a) Two fluid methods—first, by depositing copper instead of hydrogen, second, by oxidation of hydrogen; (b) single fluid oxidation of hydrogen by the use of potassium bichromate, etc.; (c) show oxidation by use of solids, as manganese dioxide, etc.

38. Electric resistance of conductor. By the method of substitution measure resistances; find the effect of varying, first, the length, and, second, the cross-section, of the conductor.

39. Wheatstone bridge. Measure resistances by use of the Wheatstone bridge.

40. Temperature coefficient. With the Wheatstone bridge, measure the resistance of a copper wire at different temperatures and compute the temperature coefficient.

Probably the most difficult task that confronts the physics teacher in the small high school is to start the equipment of a laboratory on small means. The first maxim is, buy for use and not for show. Buy the less expensive first. Get the necessities before the luxuries. Do not begin by the purchase of Geisler tubes and X-ray apparatus.

In offering suggestions in regard to the equipment of a laboratory, let us begin with the room itself. This should be dry, well lighted, and, if possible, with south exposure. Never use a basement room.

The room should be provided with heavy, flat-topped tables, about thirty-two inches high. The length and breadth of these

must often be adapted to the shape of the room, but, when possible, tables three feet wide and eight feet long will be found very convenient. These tables should have no iron in their construction, and the top should project at least three inches. Any good carpenter can make these tables.

If there is a good water system in the building the laboratory should be provided with a sink. If not, a wooden tank a foot deep, two feet wide, and three feet long, lined with zinc or galvanized iron, will be found convenient. If the laboratory can be supplied with gas, the fixtures should hang from the ceiling directly over the tables and about four feet above them. Connections can then be made with Bunsen burners by the use of rubber tubing. If no gas can be provided, gasoline torches handled with care are the best substitute.

Cases for storing apparatus should be about fourteen inches deep, with movable shelves and glass fronts. They should be self-locking, and all open with the same key. A class in physics consumes at best more of the teacher's time than one in most other branches. Everything about the laboratory should be arranged to facilitate the getting out and putting away of apparatus. Then the teacher should be expected and required to see that all tools and apparatus be locked up when not in use.

A few tools for making and repairing apparatus are an essential part of a laboratory equipment. There should be a small carpenter's work-bench, and at least the following tools: Vise, fine-toothed saw, small plane, brace, drills, screw-driver, pliers, files, small claw-hammer, tinner's snips, small soldering-iron, hack-saw.

The following apparatus, together with what can be made by the teacher and pupils, will enable a class of twelve to perform in a fairly satisfactory manner all of the forty experiments of the above list:

- |  |  |
|--|--|
| 6 metric rulers, 30 cm. long.                                  | 3 pounds glass tubing, assorted sizes.             |
| 2 meter sticks.  | 4 lead Y tubes.                                    |
| 1 vernier caliper reading to tenths of a millimeter.           | 16 feet rubber tubing one-half inch in diameter.   |
| 2 specific-gravity balances.                                   | 6 plane mirrors, 3 x 4 inches.                     |
| 2 sets weights, from .01 g. to 500 g.                          | 2 cylindrical mirrors.                             |
| 6 spring balances, 250 g., in 10 g. divisions.                 | 6 plate-glass squares, two opposite edges ground.  |
| 2 graduate cylinders 100 cubic centimeters.                    | 6 condensing lenses, different focal lengths.      |
| 1 pound bullets.   | 1 set of 6 demonstration lenses.                   |
| Spool cotton thread.   | 6 chemical thermometers.                           |
| 4 tuning-forks,  | 2 linear-expansion apparatus.                      |
| 2 apparatus for recording the vibration rate of a tuning-fork. | 30 feet rubber tubing three-eighths-inch diameter. |

2 bass-viol bows.  
 2 pieces brass tubing 1 inch in diameter  
 and 3 feet long.  
 2 square feet wire gauze.  
 6 ring stands, 3 rings each.  
 6 glass funnels.  
 6 calorimeters, thin brass, nickel plated,  
 3 x 5 inches.  
 4 bar magnets, 6 inch.  
 2 horseshoe magnets, 6 inch.  
 2 pounds iron filings.  
 6 glass tumblers.  
 1 square foot sheet copper.  
 6 battery zincs.  
 2 pounds mercury.

6 Bunsen burners or 2 gasoline torches.  
 6 flat-bottomed flasks, 500 cubic centi-  
 meters.  
 2 pounds sulfuric acid.  
 $\frac{1}{4}$  pound potassium bichromate.  
 1 pound manganese dioxide.  
 2 resistance boxes.  
 2 Wheatstone bridges.  
 4 Daniell cells, complete.  
 1 pound copper wire, 20 gauge.  
 $\frac{1}{4}$  pound resistance wire, 30 gauge.  
 2 temperature coils.  
 6 small magnetic compasses.  
 2 tangent galvanometers.

The cost of the above apparatus should be about \$130. Much additional apparatus will be needed for lecture demonstration. The teacher who has a small amount of money to expend will find it possible to get along with half of the above apparatus, cutting the numbers in two.

FOR DEMONSTRATIVE WORK, the following list includes most of the apparatus which is absolutely essential :

1 pint alcohol.  
 Glass-cutter.  
 $\frac{1}{4}$  pound alum.  
 1 dozen test-tubes.  
 1 bottle household ammonia.  
 Thistle-tube.  
 1 ounce camphor gum.  
 1 pound salt.  
 Set of pulleys.  
 Small air-pump.  
 Whirling machine.  
 Harness-maker's punch.  
 $\frac{1}{4}$  pound piano wire.  
 4 guitar strings.  
 6 feet glass tubing 1 inch in diameter.  
 6 sheets white cardboard.  
 1 crown-glass prism.  
 1 flint-glass prism.  
 1 spherical mirror, concave on one side,  
 convex on the other.  
 3 dozen large corks, assorted.

1 set colored-glass plates.  
 Colored paper.  
 $\frac{1}{4}$  pound ammonium nitrate.  
 $\frac{1}{4}$  pound sodium sulfate.  
 2 ounces ether.  
 1 air thermometer.  
 2 wide-mouthed bottles.  
 1 pound paraffin.  
 1 set knitting-needles.  
 6 broken watch-springs.  
 1 dozen pith-balls.  
 1 stick sealing-wax.  
 Piece flannel cloth.  
 Piece silk cloth.  
 1 electroscope.  
 1 telegraph sounder.  
 1 telephone receiver.  
 1 telephone transmitter.  
 4 dry batteries.  
 1 small electric motor.  
 1 induction coil.

This will enable the teacher to perform about three-fourths of the experiments given in Carhart and Chute's High-school Physics. Its cost, together with half of the apparatus of the previous list, will be about \$100.

The following valuable advice for laboratory management is taken from Chute's Laboratory Manual :

"There are in use two methods of conducting laboratory work,

the *separate* system and the *collective* system. Under the former the students work on different problems, the apparatus going around in rotation. It is difficult under this plan to have the students' work conform to a strictly logical order, but on the other hand it requires little or no duplication of apparatus. The collective system is the ideal one. Under it all are engaged on the same kind of work at the same time. It has this advantage over the separate system, a teacher can instruct all at once on any point demanding more than ordinary care and can give more attention to the few who may be less apt in their work. A combination of the two is probably the best for most schools, in that it avoids the duplication of expensive pieces of apparatus and permits it in the case of the less costly."

A small library, such as the following, will be very helpful:

Laboratory Manual of Physics, Chester-Dean-Timmerman, American Book Company.

Physical-laboratory Manual, S. E. Coleman, D. Appleton & Co.

Manual of Experimental Physics, Nichols, Smith, and Turton, Ginn & Co.

High-school Physics, edition of 1902, Carhart and Chute, Allyn & Bacon.

A Text-book of Physics, W. Watson, Longmans, Green & Co.

A History of Physics, F. Cajoei, The McMillan Company.

Smithsonian Physical Tables, prepared by Thomas Gray, published by the Smithsonian Institution, Washington, D. C.

Scientific American Supplement.

## CHEMISTRY. *One unit.*

In order that chemistry should be successfully taught, the following conditions are necessary:

1. A teacher who is enthusiastic and interested in the subject.
2. A teacher who knows more than he attempts to teach.
3. Sufficient laboratory facilities, so that one-half the time may be advantageously spent in laboratory work.
4. An abundance of laboratory apparatus, so that each student may do the experiments for himself, and not be obliged to gain his knowledge by seeing them performed by some one else.
5. A text-book sufficiently complete and modern to be of assistance to the student and the teacher.

We are perfectly aware that the above conditions may seem ideal and almost impossible of attainment in the ordinary high school, but the nearer we can come to reaching them the more satisfactory will be the work. It is true that there are only a few schools in which a teacher can devote his whole time to chemistry, and there are many schools where he is expected to teach chemistry, physics, and, perhaps, the biological sciences. Unfortunately,

since there are some schools where chemistry is simply one of the sciences which an instructor is required to teach, and since, in addition, he must carry some Latin and German "on the side," it would be better for the preparation of the student and the reputation of the school if no attempt were made to teach chemistry. If such studies as cannot be carried satisfactorily are entirely omitted from the list of subjects offered, the energy of the teaching force can be concentrated on language, mathematics, history, and physics, and better work will be the result. One reason for this suggestion is, that such subjects can be taught without much expense for illustrative material.

It goes without saying that interest in his subject and enthusiasm go very far towards making the successful teacher. But this is no more true in chemistry than in any other subject. It is too much to ask that a teacher should be equally enthusiastic in each one of a half-dozen unrelated subjects. The time has gone by when any natural science can be taught by the use of a text-book alone. The methods in use fifty years ago will not give the instruction that our progress demands. The laboratory in a high school need not be very expensive, but it should be roomy, well lighted, and well ventilated. It is most earnestly to be hoped that no more high-school buildings in this state will be arranged with the chemical and physical laboratories in the basement, for under these conditions the air of the whole building is vitiated and the opportunities for ventilation are very much curtailed. If the top floor or the attic of the building be utilized for a chemical laboratory, flues can be arranged with but little expense to connect with hoods, so that poisonous and disagreeable fumes may be immediately carried out of the building. The expense of fitting up a laboratory is very much decreased if the class is divided into several divisions for the laboratory work, as the same tables and apparatus can be used by the different divisions. If the laboratory is not supplied with sufficient material, or there are not enough desks, so that each student can perform the work by himself, there is very little profit derived from the experiments. If two, three or four attempt to perform an experiment at the same time with the same apparatus, one does the work and gets the experience while the others look on—a part of the time—and receive absolutely no benefit. In order to save time, it will be found of great advantage to have at least two hours of consecutive work in the laboratory. With forty-minute periods, as the schedule is arranged in some schools, fully a third of the time is spent in getting ready for work and in putting away the apparatus at the close of the exercise.

The high schools of the state have labored under considerable disadvantage for the past five years on account of the elementary

and unsatisfactory character of the text-book adopted in chemistry. It is hoped that with an unabridged edition of the new text-book that has been adopted, and with the laboratory manual which is included, much more satisfactory work will be possible. Students who complete two terms in chemistry with sufficient laboratory work can use this for entrance credit to the University. If students do not care to use it in this way, and wish advanced credit in the University, they must pass an examination at the stated times noted in the catalogue. A half-year of chemistry in the high school will not be accepted for entrance credit.

For the engineering courses, chemistry is not absolutely required, but as the work in the second year, first term, is given with Ostwald's Principles of Inorganic Chemistry as a text-book, a preparatory course in this subject will aid the student to understand more readily this comparatively advanced work.

Students who prepare to specialize in science during their college course cannot do better than to get as thorough a knowledge as possible of elementary physics and chemistry in the high school. There are offered in the University at present two courses in introductory chemistry—one, designed especially for medical and pharmaceutical students, extends over the first term, with five exercises a week; the other course extends through the year, with a credit of three hours the first term and two hours the second.

For teachers who propose to fit out a laboratory for chemical work, the following list of apparatus is suggested; this is practically what will be needed by one student, and will cost about \$8.50:

Beakers, nest, 100-700 c. c.  
Bunsen burner or alcohol lamp.  
Blowpipe, 10 inch.  
Corks, 2 dozen assorted.  
Deflagrating spoon.  
Evaporating dishes, 2 (75-100 mm.)  
File, round.  
File, triangular.  
Flasks, Florence, 4.  
Flask, Wolf, 1 (300 c. c.)  
Funnels, 2.  
Gauze, wire, 6x6.  
Glass tubing, soft.  
Glass rod, 1 ounce.

Iron stand with clamp.  
Mortar, porcelain (100 mm.)  
Retorts, 1 (250 c. c.)  
Rubber tubing, 3 feet, for burner.  
Rubber tubing, 2 feet, for connections.  
Safety-tube.  
Test-tubes, 12,  
Test-tube stand.  
Thistle-tube.  
Tripod.  
U tubes, 2.  
Watch-glasses, 2.  
Wire, 1 foot mg.

The following apparatus will serve without duplication for a small class, and will cost about \$10.

Burette, Mohr, grad. to .1 c. c., 50 c. c., complete.  
Cells, Bunsen, 2.  
Cork borers, set of 6.  
Condenser and tubing.  
Gas-measuring tube, grad. to .5 c. c., 25 c. c.

Magnet, 4-inch horseshoe.  
Measuring-glass, 4 ounce.  
Punch-cock, Hoffman, medium.  
Scales, set.  
Weights, set.

A list of chemicals needed for the work can readily be made out by the instructor. The actual cost to each student, when a quantity is bought at one time, need not be more than \$2 or \$3.

Apparatus and chemicals can be purchased of Eimer & Amend, 205 Third avenue, New York; of the Henry Heil Chemical Company, St. Louis; of the Chicago Laboratory Supply Company, Chicago. A discount of from ten to twenty per cent. will usually be allowed the purchaser when considerable material is bought.

The chemistry department will gladly answer any inquiries from teachers or boards of education in regard to the work, and will consider it a favor if those who have it in charge will keep in close touch with the University.

### BOTANY. *One unit.*

THE FUNCTION OF BOTANICAL INSTRUCTION. In common with other studies, botany affords training in observation and reasoning, and in planning the course this must be kept sight of in method and matter; and it is the function of an elementary course of botany also to give an exact knowledge of the most important facts about the nature of plants. The very fact that we are absolutely dependent on plants for our existence, and that they strongly influence our lives in many ways, establishes for botany a natural place in the list of the most important studies offered in the secondary schools. It should be the aim of botanical instruction in these schools not to make botanists, but to disseminate knowledge of how plants are constructed, how they get their living, how they react to their environment in a way helpful to them, what their place in nature is, and how they help us and how we may help them. The story of plants has an esthetic and a practical side. Almost any fundamental fact about plants bears on both sides; it enhances our appreciation of plants, and helps us to deal with them more intelligently. This, in a word, it is the part of botanical instruction in the secondary schools to accomplish.

THE METHOD. Primarily the plants themselves are to be studied, and only secondarily what somebody says about them. The study is to be exact, detailed, and thoughtful; not hurried, cursory, and without satisfying application and conclusion. The problem of supplying materials for a year's course is simple enough if the work is thoroughly done; but if the pupils are allowed to skip hurriedly from subject to subject, the materials for a year's course will have been gone over in a month, the pupils will have acquired no good in training or knowledge, and the teacher will complain that it is impossible to offer a year's course in the secondary schools. To insure the right sort of work the pupils are

to make neat and exact drawings and intelligent notes for each subject worked out in the laboratory. The drawings are to be made with a hard drawing-pencil (6-H Koh-I-Noor is the most satisfactory), on heavy, unruled linen ledger paper. The notes, written in ink, are to face the drawings, so that drawings and notes can be compared without turning the page. The notes should be on separate sheets, and not on the backs of the drawings. Both drawings and notes are to be placed symmetrically on the pages. Before beginning a page of drawings, it is to be determined how many are to go on that page and where they are to be placed, so that when the pages are completed they will be pleasing in their symmetry. The drawings are to be simple outlines, done with care, so that they are distinct, neat, and in right proportion. When the pages are done, drawings and notes, they are to show intelligently and truthfully what the pupil should learn from his subject, and they should be pleasing to look at. Inexact and sloven work is an abomination, and worse than nothing. To let such work pass is to do the pupil an injury.

Why require drawings when so much time is consumed in their making? Because they are the most exact and simplest mode of expression in the study of form and structure. Pupils who think they cannot draw can yet express themselves about form and structure better in that way than in spoken or written language. Again, when drawings are to be made, the pupil becomes a more exact observer. The notes are to tell what the parts of the drawings are, how the materials are prepared for study, and what facts of plant life, structural, physiological, or ecological, have been learned. They should show that the pupil has been thinking about his work and sees its meaning. To insure that all this be well done the laboratory book must be gone over by the teacher at frequent intervals, and its defects discussed with the pupil, and the necessary improvement insisted on before a passing grade is obtained. In being thus guided with a firm hand the pupils are apt to like their work better and are sure to respect it.

Whenever possible, physiological experiments should accompany the laboratory work on form and structure. These may be prepared by the teacher, or they may be assigned to groups of pupils for demonstration before the entire class. Directions for such experiments will be found in some of the books cited below. Form and structure dissociated from physiological function or adaptation to the outer world are the mere husks of botany, and as soon as learned they are to be followed by an inquiry into their reason for being. Studied in this way, botany is a subject of intense interest to any one who wants to know what and how God hath wrought.

Happily physiological experimentation is within the possibilities of any school, for the necessary apparatus is simple and can be arranged by teacher or pupils.

Field excursions are a good thing. The teacher should take out not more than eight or ten pupils at a time. He should go over the ground beforehand and become familiar with the problems that can be worked out in the locality to be visited. In the laboratory, form, structure and function are learned to best advantage, and in the field, adaptation to the outer world, and distribution. Therefore field-work becomes necessary to a properly rounded course. But it should be genuine and definite work, and not a merely pleasurable excursion. To insure successful field-work the teacher must be familiar with the ground to be traversed, must have put definite problems before the pupils, with a plan for their execution, and must have only a small group of pupils to supervise.

The time devoted to botany, including laboratory work, recitations, and discussions, but not preparation for recitations, should be not less than five hours per week. Where the periods are less than one hour, as in most instances, the pupils should be required to complete the time at other hours. This is justifiable, since the preparation for recitations does not require as much time as other studies, two recitations per week being all that would be necessary.

**EQUIPMENT.** The first requisite is a well-prepared and enthusiastic teacher. When a teacher with little or no preparation is made to teach botany as a side issue it is injustice to the teacher, the pupils, and the subject. It were far better not to offer the subject at all under such conditions. It may be stated as a general rule that to be well prepared the teacher should have worked through the equivalent of the botany courses I to V, inclusive, in the University catalogue for 1903-'04, namely, courses in elementary structural botany, plant histology, cryptogamic botany, experimental plant physiology, and systematic botany. With such preparation, the right sort of a teacher is bound to make a success of his course, no matter how poor the laboratory equipment may be. But a good laboratory equipment is a great help, and so inexpensive that no school need be without it. There should be flat-topped tables, about thirty inches high, affording elbow room for each pupil, placed before windows, so as to get plenty of light. Each pupil is to have a good magnifier mounted on a block, so as to leave both hands free for the use of dissecting needles. The doublet magnifiers of three-fourths-inch focus manufactured by Bausch & Lomb, Rochester, N. Y., or by the Spencer Lens Company, Buffalo, N. Y., are satisfactory. The blocks may be made as described in Stevens's *Introduction to Botany*, page 371. The Barnes dissecting micro-

scopes made by Bausch & Lomb, and listed at \$2.50, but subject to discount, will answer every purpose. Each pupil it to have two dissecting needles (easily made by thrusting strong needles into soft wood handles), and a sharp pocket-knife. This completes the apparatus needed by each pupil.

The laboratory should have at least one compound microscope for the demonstration of minute anatomy. More of these, if it can be afforded, would be highly desirable. The Bausch & Lomb BB4 special, and the Spencer No. 50 E, compound-microscope outfits, sold to schools at approximately thirty-five dollars, fill all requirements. There are cheaper outfits supplied by these companies and other dealers. Even the cheapest outfits of the Bausch & Lomb and Spencer companies, catalogued as A1 and 80 A, respectively, costing schools approximately ten dollars, would prove very useful. The laboratory should own a Spencer table microtome for hand-sectioning and a sectioning razor, together costing schools ten dollars. Information about the necessary stains, reagents, etc., will be found in some of the books cited below. If the school can afford it, the laboratory could be more completely equipped as advised in Ganong's *Teaching Botanist*, mentioned in the book list below.

In carrying out a course logical in sequence, such as that outlined below, some facilities for preparing materials must be provided. First of all there should be a room, or part of a room, kept warm enough for germinating seeds successfully, provided with rough boxes filled with white pine sawdust for seed-beds, and jars holding water in which branches of woody plants can be forced into leaf and blossom when needed. Some schools use successfully the basement furnace-room for this purpose, and any basement room will do that can be kept warm enough. Then there should be a cupboard in which seeds and fruits gathered during the summer to illustrate dissemination can be stored in boxes away from the mice, and in which Mason jars containing two per cent. formalin, or equal parts of alcohol, glycerine, and water, for preserving flowers and parts of plants for sectioning, can be kept handy and safe from breakage. A general might as well attempt a campaign without ammunition as a teacher a course in botany without having planned to supply the necessary materials for study in abundance, at the right time, and in suitable condition. Directions for providing materials will be found in detail in Ganong's *Teaching Botanist* and Stevens's *Introduction to Botany*.

**THE COURSE.** In planning the course two questions chiefly must be considered: What subjects will give the best enlightenment about plants in the brief time of an elementary course? And what

materials is it practicable for the secondary schools to provide for laboratory study in abundance throughout the school year? Happily these are not conflicting problems. Their solution is found in the following sequence of subjects:

1. *Seeds and Seedlings.* Study Lima bean, castor-bean, and Indian corn, dry, soaked, and in different stages of germination. A seed is a plant in its simplest terms, and affords a logical beginning. The pupil is to learn what a seed is, what its purpose is, what its different parts are for, and how they perform their functions during the resting period of the seed and during germination.

In the food stored in seeds he learns what sorts of materials constitute the real food of plants. In watching what becomes of this food during germination he learns about digestion and the assimilation of food into new plant substances. By simple experiments with germinating seeds he learns the conditions necessary to growth, and about respiration. In watching the parts of the seedling find their wonted directions of growth, no matter in what positions the seeds lie, and with simple experiments to bring out further information, he learns that plants are sensible to outer influences, and respond in a way to accomplish for themselves the most good. By comparing the different types of seeds and their variations of habit in germination he learns how plants of different kinds work out the problems of their existence in ways dissimilar in detail but alike in general result. With this much accomplished the pupil has made a good beginning in method, knowledge, and awakened interest.

2. *Roots.* Study the definite order of outgrowth of lateral roots from the main root of seedlings, and the indefinite order of succeeding rootlets. Study root-hairs on seedlings grown on moist blotting-paper or in any suitable moist chamber. Demonstrate with a compound microscope the cellular structure of roots in cross and longitudinal sections, calling particular attention to the tracheal tubes through which the water rises in the plant. Demonstrate the rise of water by osmosis in an artificial apparatus. Demonstrate the attraction of roots by moisture. The pupil is to learn the function of roots in fixation, absorption, and conduction; the nature of root-hairs, and how admirably they are adapted to fit into the small interstices of the soil and put themselves in close contact with its finest particles, so as to absorb the films of water about them and the minerals in solution. He is to learn here what the plasmatic membrane is and how it keeps the important substances of the cell sap from becoming lost into the soil while permitting the entrance of water and dissolved substances. He is to study the formation of adventitious roots in cuttings, and their value in the propagation of plants. He is to learn about roots used for storage,

the roots of parasites, as in dodder, and the roots of air plants. He is to learn about the nature of the soil, and the great extent and depth which some roots have.

3. *Buds and Stems.* Study young branches, with buds in their winter condition, of horse-chestnut, cottonwood, and lilac. Horse-chestnut is particularly fine; but if it cannot be obtained, hickory may take its place. Study these buds in various stages of unfolding, having forced their growth in jars of water in a warm room. Study leaves in embryo in the bud, and note their behavior as they grow to maturity, and try to find good reasons for everything observed. Study position of leaves on the stem, and their relation to lateral buds, and the age of the stem on which they are found. Demonstrate the cellular anatomy of stems in cross and longitudinal sections. Learn the functions of the different zones of tissues in bark and wood. Learn the nature of a ring of growth and the purpose of its two zones of early and late growth. Examine the cellular structure of the stem of a monocotyledonous plant, such as corn. Study experiments to show the rise of water through the wood and the circulation of elaborated food through the inner bark. Study the use of buds and cuttings in plant propagation. Proceeding in this order, the pupil learns the nature of a shoot (stem and leaves) in its embryonic condition in the bud, and how the favorable conditions of spring are quickly used to advantage by having the parts which are to grow forth already formed in a miniature the previous season. He learns the admirable plan of packing these parts away within the small compass of a bud, and protecting them by means of scales, hairs, resinous substances, etc. He learns that there is a double highway for the conduction of materials in plants, and he should think this over and find the wisdom in it. The "ring of growth" is no longer a mere phrase, but answers a physiological necessity. He learns that the qualities of a plant may reside in every small part of it, so that a single bud can transmit faithfully all that a plant is, and so be one of the most important means of propagation; and he should see how the habits and mode of life of plants demand this. By a comparison of the cellular anatomy of dicotyledonous and monocotyledonous stems he learns how plants have solved the problem of increase in diameter and provision for strength and the transportation of materials after two distinct plans; to best advantage, however, evidently in the dicotyledonous plan, since a vastly greater variety of such plants have succeeded as trees.

4. *Leaves.* Study leaves of different shapes and sizes, and, wherever possible, see how form, size, angular divergence and vertical distances apart are correlated with the size and habit of

the plant and the place in which it grows. Study the positions which leaves take with reference to the incident light, including such a variety of positions as shown by the elm, maple, cottonwood, Solomon's seal, grasses, and compass plants. Determine whether these different positions are equally advantageous, and whether there is not an ideal position that would serve best in all cases. Determine by experiment what light has to do with the directions which leaves assume. Study the cellular anatomy of a leaf; the epidermis with its stomata and its imperviousness to water; the palisade and spongy parenchyma with their chloroplasts, the intercellular spaces, and the vascular bundles of veins. Compare the starch content of leaves that have been kept in the dark with that of those which have been kept in the light. Study the starch content of leaves that have been kept in the light in an atmosphere devoid of carbon dioxide, and of leaves kept in the light with stomata artificially closed. Confine leaves under glass jars, and study the effect on the oxygen and carbon-dioxide content of the jars when kept in the light, and again in the dark. Demonstrate the transpiration of water by the leaves. Compare leaves of ordinary land plants, desert plants, and water plants, and determine the reasons for their chief differences. The pupil learns that the leaf is the part of the plant which has the manufacture of the plant's food as its chief function. He learns how carbon dioxide is used in this process, and the fact that the sunlight supplies the necessary energy; he learns that leaves breathe (it is not implied that the other parts of plants do not breathe, for they do), and that the water absorbed by the roots is given off by them. He understands, when he compares the cellular anatomy with the particular function of each part, the wonderful structural adaptation to the energy and materials to be used and the work to be done. He learns that leaves are able to perceive the direction of the source of light and to respond to it in a useful way. In studying the different kinds of leaves he perceives the fact of great variability, one of the most important facts in nature. In comparing the leaves of ordinary land plants, desert plants, and water plants, he learns of the power of plants to modify the forms and character of their members in a way that is directly adaptive to their environment, another of the most important facts in nature.

5. *Growth and Movement.* With a compound microscope demonstrate the embryonic condition of the cells at the apex of an onion root, and show how these become changed into permanent tissues of the bark and wood farther back in the older portions of the root. Learn the processes of nuclear and cell division and the evident significance of the great care taken. Demonstrate regions

of continued growth in dicotyledonous plants and grasses. Demonstrate the effect of different intensities of light on growth. Determine the relation of the cambium ring to the additions to wood and bark. Study under different conditions the behavior of the leaves of sensitive-plant seedlings grown under bell jars ventilated at the bottom. Study the behavior of twining plants and sensitive tendrils. Read about other cases of sensitiveness in plants. It will be noted that most of this work consists of demonstrations before the entire class. While the subject of growth and movement as here outlined does not consume much time it is yet one of the most important in plant study. The pupil is introduced to the wonderful facts of cell multiplication, and differentiation from a common origin into various forms to meet different functions. He will find it interesting and instructive to speculate why plants continue to increase in size just where they do and not otherwheres. He has learned more about the sensitiveness of plants to the outer world and their ability to respond to their perceptions in a useful way. He is now prepared to see that plants are endowed with something little short of intelligence.

6. *Modified Parts.* Study roots, stems, and leaves that have been modified so as to perform other than their usual functions; thus, the thorns of wild crab, hedge, and honey-locust; sweet and Irish potatoes; the onion; the tendrils of wild smilax and garden pea; all of the vegetative parts of greenhouse smilax and garden asparagus. Here the pupil learns more about the plasticity of plants in molding the forms of their members to meet specific requirements, and the capacity of plants to vary for known or unknown reasons, and he is in a position to understand better how the great diversity of plant forms has come about. In applying the lines of evidence which he must follow in determining whether unusual forms are roots, stems, leaves, or something else, he is getting good training in careful observation and logical conclusion.

The work thus far outlined, done with the care suggested under "Method," begun at the opening of school in the fall, will not be completed long before the flowers of early spring appear. We are now ready to take up the study of flowers, and the gap can be supplied with flowers that hold their form well in formalin, such as the yucca, asclepias, trumpet-creeper, and Compositæ of the sunflower sorts. It will be noted that the material needed for the course up to this point is such as can be provided right along through the winter with the most ordinary facilities.

7. *Flowers.* Study first flowers of simple construction, such as the yucca, dog's-tooth violet, anemone, and shepherd's purse. Then select flowers of more complex construction which have been adapted

to protect pollen and nectar and to assist in cross-pollination, such as asclepias, larkspur, iris, and violet. Then study several species of a genus, several genera of a family, and typical species of closely allied families, to bring out the evidences of relationship and the grounds for classification. The object is not to work over as many flowers as possible, but to select a few with a definite purpose in each case. The teacher should see that the leading questions properly pertaining to each flower selected have been asked and answered. The teacher will find many useful suggestions in Müller's *Fertilization of Flowers*, and Kerner and Oliver's *Natural History of Plants*. With diagrams make clear the processes of fertilization and the results. Discuss the benefits of cross-fertilization and in this light interpret the frequent elaborate devices to secure it. Besides the drawings of dissections, have the pupils make cross and longitudinal diagrams of the flowers to bring out the main structural facts clearly. Go over the evidence about the evolution of a flower from its simpler representatives in the lower plants. The pupil learns what a flower is and how its different parts are adapted to their functions. He learns the wonderful relation of insects to flowers, and how many flowers have adapted themselves to this relationship by modifications of form, etc. And so the evidence is accumulating for him that plants are not cast in rigid molds, but are responsive and adaptive to various influences of the outer world. He learns that there is a real blood relationship between plants differing in general appearance, and that, although there is no written book of lineage for them, the evidence of relationship is by no means obscure and furnishes the ground for classification. He learns the essential facts about sex, the same in plants as in animals, and the use of sex differences in bringing about a more vigorous offspring, and as a means of variation. With this knowledge he has a foundation for an understanding of scientific plant-breeding, which is now being perfected in the experimental stations and is proving of untold advantage to agriculture. Thus his appreciation of flowers is definite and increased many fold.

8. *Distribution of Fruits and Seeds.* Study special devices for scattering seeds, by means of the elastic action of carpels and ways of that kind, or by outgrowths from the seeds themselves in the form of hooks, hairs, or wings. Study fruits that have devices to aid distribution, such as fleshy and nut-like fruits, and fruits with hooks, parachutes, and wings, etc. Determine in each case what part of the seed or fruit furnishes the device. For this work material must have been put up in formalin or dry in boxes the previous summer or fall. The pupil learns the efforts which plants have themselves made to secure dissemination. He learns that they have

been able to attain the same end in a great variety of ways; that they have modified various of their own parts, and pressed into service different kinds of outside agents. The evidence of the completeness of the adjustment of plants to their environment has been accumulating before the pupil throughout the entire course.

9. *Algæ, Fungi, Mosses, Ferns.* The work in these subjects cannot be so thorough as in the previous ones, because the time will not permit, and the equipment in compound microscopes will in all probability not be sufficient. But the pupil must not leave the subject of botany without some exact knowledge of these lower plants. Study with the naked eye, simple magnifiers, and as much as possible with a compound microscope, algæ growing in ponds, watering-troughs, etc., and on the north sides of trees; bread mold, wheat rust, and toadstools; mosses bearing capsules; ferns with sporangia, and their prothallia. Even with this cursory study a great deal will be cleared up that before was obscure to the pupil. In the study of the algæ the pupil learns by what simple forms an independent existence can be carried on, and he sees in them the possibly very early progenitors of the highest forms of the present day. He learns about the simplest mode of multiplication by the division of a parent cell, and possibly his material will show the formation of spores. In the fungi he learns about the peculiar habit of parasitism or saprophytism. He sees in them the apparently degenerate descendants of the algæ that have lost their chlorophyll, and consequently their independence, or it may be that they gave up their independence and lost their chlorophyll as a penalty. He learns that these forms of life cause the destruction of organic substances, and disease in living organisms. In the study of fungi the bacteria and their activities may have also been considered. In the study of mosses he sees the first efforts at the differentiation of the plant body into roots and leaf-bearing stems, but with true roots not yet evolved. He sees the very simplest forms of leaves, which are, nevertheless, efficient food-makers. In the ferns the pupil finds a more successful attempt to differentiate the plant body into roots, stems, and leaves. He sees a clear case of the wonderful habit of alternation of generations, which is present but obscure in the mosses, and present and still more obscure in the higher plants. The teacher will use his own judgment about attempting to relate the story of alternation of generations and its apparent significance in the study of evolution. It is one of the wonderful things about plant life, and of great use as evidence of relationship between the lower and higher forms. But it is an unusually difficult subject, and unless thoroughly exploited is apt to lead only to confusion. Still, it would seem too bad to pass so close to a wonderful fact and leave it untouched.

This will end the year's course. It will be seen that it is full of hard work and requires a wide-awake mind. But we expect this of any study that is worth while. Having gone through it thoroughly the pupil's horizon will have been immensely broadened and his interest in the world about him enhanced.

There seems to be the absurdity abroad, even among some school-teachers, that the study of botany in the high schools should be made easy—a sort of gentle wafting of the pupils on beds of roses into a more or less sentimental appreciation of form, color, and fragrance, and the like. It seems to be a product of the fairy-tale sort of nature study which gives a cheap representation of what, as it stands uncolored, is already marvelous beyond conception.

It is this fictitious sort of botany, without any care for the exact truth, and without purpose or logical sequence in its methods, and unexacting of those who study it, that has brought the real science into disrepute amongst serious people, and kept it from taking its rightful place by the side of language and mathematics, as affording the right sort of training and a worthy body of knowledge.

10. *Helpful Books.* There is one book that stands preeminent in its helpfulness to teachers: *The Teaching Botanist*, by William F. Ganong, published by the Macmillan Company, New York. In it a sufficiently complete list of botanical books will be found. Some other books should be mentioned here. Müller's *Fertilization of Flowers*, the Macmillan Company, is an indispensable help in the study of flowers. Kerner and Oliver's *Natural History of Plants*, Henry Holt & Co., New York, is replete with information about all phases of plant study; this should be in every school library. Geddes's *Chapters in Modern Botany*, Charles Scribner's Sons, New York, is a series of very interesting essays in the modern scientific spirit. Barnes's *Plant Life*, Henry Holt & Co., is a clear and logical presentation of the subject from the standpoint of the relation of form to function. *A Text-book of Botany*, by Strasburger Noll, Schenck, and Schimper, is written by specialists in its different parts, and is one of the most satisfactory texts yet published. This is issued by the Macmillan Company. Ganong's *Plant Physiology*, Henry Holt & Co., contains explicit directions for carrying out the experiments demanded in the above course. Stevens's *Introduction to Botany*, D. C. Heath & Co., Boston, contains detailed directions for carrying on such a course as is outlined above. Peirce's *Plant Physiology*, Henry Holt & Co., contains a clear and up-to-date summary of our knowledge of physiological processes. Chamberlain's *Methods in Plant Histology*, issued by the University of Chicago Press, is an excellent guide to histological technique. Professor Coulter's books, *Plant Relations* and *Plant Structures*, beautifully written and illustrated, issued by D. Appleton & Co., New York, should be in every school library.

ZOOLOGY. *One unit.*

To meet the many and increasing frequent requests for information concerning the teaching of zoology in the high schools, this circular is issued. The growing importance of the biological sciences in both the high-school and college curricula makes necessary, so far as possible, the establishment of some standard which shall serve to coordinate the work of the different schools of the state. In addition to thus outlining a course of study, there will be included suggestions regarding laboratories, apparatus, and materials, which, it is hoped, may be of service. This is done because numerous letters received from the teachers of zoology throughout the state indicate the desire for assistance of this sort. It is the wish of the department of zoology at the University to be of service to the other public schools of the state in carrying on the work with which it is concerned, and it is hoped that the teachers of the secondary schools will come into as close touch as possible with the department and its instructors.

**PURPOSE OF THE COURSE.** There is hardly any necessity for saying that, in making the suggestions regarding the high-school course of zoology that follow, the main thought kept in mind has been, not what would be best for the student who wishes to continue the subject at the University, but what will give him the best sort of training in that province of learning which it is the peculiar privilege of the observational sciences to occupy. And in this connection it may here be observed that the best teachers of these sciences do not regard the elementary courses as primarily designed for affording information, but rather as a means for training the mind to observe facts and to arrange and present these in a clear and logical manner.

**CHARACTER AND EQUIPMENT OF THE LABORATORY.** Obviously there can be no training of this sort by means of mere text-book work, and so it may be said in the beginning that the prime necessity of a course is direct study of the animals themselves. This necessitates a laboratory and suitable equipment. Regarding the room, it may be said that it is almost necessary to have it arranged so that it may be used for the one purpose alone, and to have it provided with tables rather than with desks. These need not be expensive, since the common kitchen table serves very well. Numerous windows are an advantage, and they are best situated on the north side. So far as general laboratory equipment is concerned it may be very simple. There will need to be receptacles for holding the specimens, and for this purpose stone jars of four or five gallons capacity serve excellently. Then some aquaria for live material are needed. These may be purchased at reasonable

prices, but in their absence candy jars, fruit jars, battery jars or any glass vessel of sufficient size will do. Ordinarily the greatest difficulty is encountered in the equipment of the individual student. The following account of such apparatus as the student finds necessary for his work was published in the *Journal of Applied Microscopy*, and indicates what it has been found possible to get along with at the University :

**APPARATUS FOR THE INDIVIDUAL STUDENT.** The question of a suitable equipment for large laboratory classes in elementary zoology is often a most serious and perplexing one. Not only is it difficult to find the pieces of apparatus already made, but even when purchasable the attendant expense makes them unavailable in many cases where large numbers are required. In nearly every laboratory these difficulties have been met and solved more or less satisfactorily, usually by designing such apparatus as can be made in local shops.

Such a set for the individual student, evolved in actual practical work, is described here. Aside from dissecting pans and instruments, it consists of two pieces—one an easel, the other a standard for the support of lenses, etc. The easel is merely a piece of soft pine or poplar board  $5 \times 6 \times \frac{1}{4}$  inches, supported behind by a piece of bent wire attached by small staples. Crude and simple as this is, it insures better work for the student at a much less degree of personal discomfort than is otherwise possible. Since the style of drawing usually required of beginners is that known as orthographic projection, it becomes necessary to view the specimen from directly above each part drawn. If no support is provided, the student either lays the specimen upon the table and endeavors to look down upon it, or he props it against books or other objects, so that it may be observed more easily. In either case the process is time-consuming and troublesome.

The specimen, a crayfish for example, is pinned to the board against a suitable shade of paper for a background, the appendages are arranged and secured to the board, which is then erected at such an angle that the line of sight falls upon it normal to the surface. In this position the animal is well lighted, is easily measured, and the tendency to introduce perspective in the drawing is minimized. When a lateral view is desired, the specimen is pinned to the top of the board near one side, the abdomen is flexed in a natural manner and fastened to the side, the appendages are brought down and secured, and the easel adjusted at the upper angle. It is not difficult to draw the animal when thus mounted, for a proper view is easily obtainable, and the edges of the board serve as guide-lines from which to measure.

The lens support is made by taking a piece of brass rod three-sixteenths of an inch in diameter by ten inches in length, rounding one end with a file, and splitting the other in the center for an inch with a saw. Two holes are drilled through this end at right angles to the split, and then, after heating, the halves are bent out until the flat surfaces lie in one plane. By means of rivets passing through the small holes the rod is secured in the middle of a tin ointment box lid about three inches in diameter, which, in turn, is filled with melted lead. The standard thus produced is very firm and stable and occupies little room.

The lens holder attaching the magnifier to the standard is made by taking suitable brass or galvanized-iron wire and forming on one end a loop of a proper size to hold the lens, and on the other a close spiral of about four or five turns whose inner diameter is very slightly greater than that of the brass rod in the standard. Two of these are conveniently formed at one time by winding a spiral of eight or ten turns in the middle of a piece of wire twice the length of the desired support. This is then cut through the center and rings formed at the free ends for holding the lenses. It is advantageous to bend the support downwards, so that the lens may be lowered over the edge of the dissecting pan. A lens thus supported may be swung around over a large specimen, and is conveniently focused by sliding the spiral up and down the brass rod.

This apparatus, by the addition of another lens support, serves an excellent purpose in the examination of small parts and dissections, and makes the use of the microscope much easier for the beginner. In making use of the apparatus for this purpose, it is arranged as follows: Upon the ring of the lower support is placed a piece of non-drying modeling clay (to be purchased of dealers in art and laboratory supplies). If the parts are to be examined dry, they are pressed down into the clay and arranged as desired; if they are to be immersed in water, a depression of suitable dimensions is made, and in the bottom the parts are secured. Water is now poured into the improvised pan and the specimen is ready for observation. Should specimens transfixed by pins be used, they are easily fixed and oriented in the clay. The holder is elevated to a convenient height above the table, the lens is focused, and the observer may then examine the specimen with one eye and, without moving the head, make the drawing.

The modeling clay previously mentioned is useful in many ways. When irregular objects are to be held in position, either upon the table, easel, or wire support, they may quickly and easily be secured by a piece of the clay. Small fragile structures, such as the mouth-parts of insects, are readily mounted in any position by pressing

them into the surface of the clay. Numerous other uses suggest themselves in practical work which need not be mentioned.

Aside from the two pieces of apparatus described, nothing more is required for class use except dissecting pans and instruments. The former should be of different sizes, and may be made by pouring melted paraffin into suitable tin pans. It is usually desirable to have projections of some sort in the bottom to anchor the paraffin. For many purposes a black background is desirable, and this is obtained by mixing lampblack with the melted paraffin. Small pans may be made by using the bodies of the ointment boxes, the tops of which were utilized as the bases of the lens standards. Small pasteboard boxes thoroughly soaked in melted paraffin are light and convenient and last well.

Improvised dissecting instruments, except needles, are not to be recommended. Excellent ones, perfectly adapted to their purposes, may be purchased at reasonable prices, and are always to be preferred.

OUTLINE OF THE COURSE. Every teacher has his own ways of working, and can secure the best results by following out the methods that seem to him best adapted to the time and place. Nevertheless, there are certain general principles that should govern the presentation of any subject, and in order to indicate the nature of these to such teachers as may be in doubt concerning the extent and character of the work involved in an elementary course in zoology, some suggestions may be given. In the first place, it must always be held clearly in mind that zoology is the study of animals and not of text-books. Evidently enough, then, the course must be so arranged as to give the student the largest personal-acquaintance with animal forms, and since it is obviously impossible to bring before him anything but a small representation of the animal kingdom, such a selection must be made as will give a place to all the important groups. In this matter of selecting the so-called "type specimens" there is a good deal of latitude, which may be improved by utilizing common indigenous forms, but the temptation to take what is at hand must not be allowed to exclude from consideration representatives of important groups that are not so immediately available.

In making this selection of types, then, the first consideration is representativeness. The form chosen for study must be one that exhibits clearly the peculiarities of structure which mark the group of which it is a member. In general only the salient morphological points can be brought out, but in one or two forms that are particularly favorable a more detailed study can be undertaken with profit. By this means the relative values of structural characters

as a means for determining the relationships of animals can be demonstrated practically. The number of groups that can be studied will depend to some extent upon the availability of the material and upon the equipment with which it is to be so studied. In general, representatives of the following branches will be found adapted to the ordinary high school: Arthropoda, Mollusca, Echinodermata, Annulata, Coelenterata, and Vertebrata. Because of their numerical importance and practical bearing upon human affairs the arthropods may demand a more extended consideration than the other types.

To meet the requirements of the course there may be selected the following animals for the laboratory work: Crawfish;\* grasshopper; clam; starfish; earthworm; jelly-fish; frog. Of this list, all except the starfish and jelly-fish may be found in practically any part of Kansas, so that, as a matter of convenience, they leave nothing to be desired. These forms represent their branches perhaps as well as individual species may, and are of convenient size to work with.

The order in which these forms are taken up is of no little importance, but it is scarcely possible to make a rule that is of general applicability. A strictly logical method of procedure would, of course, be to commence with the lowest forms and study the higher in the order of their complexity, or conversely, to note the highest development of morphological characters, and then to trace them back in the simpler animals. To most workers there have appeared practical objections to both plans. In the first instance the forms are small and require the use of a compound microscope, which places the beginning student at the double disadvantage of working with strange objects under quite unfamiliar conditions of observation. There is the further difficulty that an instalment of compound microscopes is necessary, and this is often beyond the resources of the high school. The main objection to the second plan is that it introduces the student to a highly complex development of the various systems which not only renders necessary very skilful dissecting work, but occupies a disproportionate amount of time for attaining what is desired of the beginner. A compromise plan which is thought by many to obviate to a considerable extent the difficulties attaching to the others is to start the student out on a form of convenient size in which the various systems are well enough developed to show in a simple way the main features characterizing them. In this manner the principal structural fea-

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\* This word is usually written *crayfish*, a corruption of the French *ecrevisse*, but it seems to me that if the animal is to be called a fish at all the practice of the American boy in denominating it a *crayfish* is most apt, since the animal's stomach is so much like this part of the bird's anatomy in function.

tures and relations of organism may be brought out in a somewhat diagrammatic way, and then by working down to the simpler forms the earlier stages of development may be seen and understood. Finally, with all this preparation, the vertebrate type may be studied and its complex structures appreciated. It is with this idea in mind that the arrangement of types previously suggested has been made.

The mere study of these few specimens, however, is not sufficient—such a course would be almost as bad as the use of a textbook alone. Two things are sought from the personal study of the type specimens by the student. In the first place, it trains his powers of observation and comparison, and gives the instructor an opportunity to determine where the weak points in his preparation and work are. The other end sought is to give the student a concrete detailed image of one animal out of a representative group. With a definite conception thus established regarding the type specimen, it is possible to take up other members of the group and bring out the structural features of the various subgroups. As an example of how this part of the work may be carried on, the case of the grasshopper, the crawfish and the other arthropods may be instanced. If the crawfish has first been studied as the representative of the lowest arthropod class, then the grasshopper, representing the highest class, after having carefully been worked out as an independent organism, may be compared system by system with the crawfish. This will develop the main resemblances and differences in the arthropods, so that the student will know what characters differentiate this branch from others. Specimens of the Arachnida and Myriapoda may then be examined and the further class distinctions noted. It is not necessary for the student to dissect and draw all the forms; it is, in fact, much better for the instructor to take a few students aside and confront them with the specimens, asking them to tell wherein they resemble the forms already studied. If they have previously listened to a lecture upon the whole arthropod branch, or have read up in a good text upon the subject, they may be asked to classify the specimens into classes. When the main characters of the branch have thus been worked out by the student, attention may be turned to minor structural characters which serve to differentiate the subgroups.

To indicate how this part of the work may be presented, a series of comparisons based upon the grasshopper may be suggested. The grasshopper, from the order Orthoptera, may be compared with specimens of other insect orders, under the immediate supervision of the teacher, if possible, and these group characters brought out. When the students have acquired the ability to dis-

tinguish the insect orders, family characters in the Orthoptera may be illustrated by specimens of crickets, cockroaches, walking-sticks, etc. If it is thought desirable to go further, generic and specific characters may be pointed out in the type form studied. The general principle always to be followed is to proceed from the known ground established by a study of the type into the unfamiliar territory occupied by the nearly related forms. When one branch is thus disposed of, another is taken up in a similar manner, and after having been worked over is compared with the previously studied group, so as to establish broad relationships connecting the two. In this way the student is gradually led to a general conception of the animal kingdom, based upon his own individual experiences.

Along with this first-hand observation and correlation work, which should be embodied in a well-kept note-book, there should go careful readings and recitations upon the general laws and phenomena appearing in animals. The life-histories of a few forms should be studied personally and read about by the students, and some simple physiological experiments carried out. It is a good exercise to have certain topics assigned for investigation and require written reports upon them. Insects offer good opportunities for this kind of work, and such questions as the following may cause the student to make profitable direct observations upon the living animal: "What structures and markings upon grasshoppers shield them from attacks of enemies?" "Describe the methods of flight in four species of grasshoppers." "Observe the actions of two grasshoppers when they meet—do they appear to have any means of communication?" "Do different species of grasshoppers appear to inhabit particular localities?" "What parasites can you find in or upon the grasshopper?"

**COLLECTION AND CARE OF MATERIAL.** In most cases it is a comparatively easy matter to secure supplies of grasshoppers, crawfish, clams, earthworms, etc., and wherever it is possible to have the fresh material it will usually be best to use it. When it is not convenient to keep or to secure specimens of this character, preserved material of the proper sort will serve most purposes. A rule that should almost invariably be observed is to secure material when it is plentiful, and not wait until it is needed. The cheapest and most convenient preservative is a solution of formaldehyde gas. This occurs in the market as a forty-per-cent. solution, called *formalin*, which is to be diluted to two per cent. or four per cent. A two-per-cent. solution is made by taking one part of formalin and nineteen parts of water; a four-per-cent. solution, by using one part of formalin and nine parts of water.

Generally the specimens should go into the four-per-cent. solution for three or four days and then be kept in the weaker mixture. Earthworms must be killed and preserved in alcohol. If running water is available, sufficient live crawfish, clams, etc., may be kept in aquaria, or even in its absence, by keeping aquatic plants with the animals they will thus secure enough oxygen. Earthworms may be kept in a tub of dirt, if it is moistened occasionally. Cages of screen wire may easily be improvised for keeping grasshoppers alive.

WHERE TO PURCHASE SUPPLIES. Microscopes and laboratory apparatus: Bausch & Lomb Optical Company, Rochester, N. Y.; Spencer Lens Company, Buffalo, N. Y. Marine specimens: Supply Department, Woods Hole Biological Laboratory, Woods Hole, Mass.; Henry M. Stevens, Carlisle, Iowa. Land and fresh-water forms: Wm. H. Bailey, Lawrence, Kan. Glassware, etc.: Whitall, Tatum & Co., Philadelphia, Pa.

### EUROPEAN HISTORY. *Three units.*

The entrance regulations of the University provide that two units of European history must be completed before the end of the Sophomore year. A unit is interpreted to mean one year of five hours a week in high school, or one term of five hours a week in the University. Credit is given only for work in English history; ancient history—*i. e.*, history of Greece and Rome; or medieval and modern European history—*i. e.*, the history of Europe since 800. One term's credit will be given to students presenting a year's work in the high school in any of these subjects. The department of European history offers three courses mentioned above in the Freshman and Sophomore years in the University, so that students who have not taken any or all of them during their high-school course have ample opportunity to do the work after entering the University. Students who receive credit at entrance for work done in the high school, however, cannot, of course, take the same work in the University for credit. Each of these courses, whether done in high school or University, must be complete in itself, and no entrance credit can be given for such courses done as part of the work in general history. It is expected, of course, that the high-school work in history will include as much outside reading, map-making and note-taking as possible.

CURRICULUM. The American Historical Association has recommended that four years be given to the study of history in high schools, whenever it is practicable to do so. When this can be done, the first year should be devoted to Greek and Roman history, with a preliminary study of the oriental nations; the second year,

to medieval and modern European history; the third, to English history; and the fourth, to American history. Those schools which find it desirable to give only three years to history are recommended to place Greek and Roman history in the second year, English history in the third year, and American history in the fourth. When two years only can be given to history, either Greek and Roman or English history may be chosen, in which case the third year is recommended. If a separate course in medieval and modern European history is not given, English history should be treated with constant reference to European history. The department of European history in the University of Kansas hopes that those high schools which have a four-year course of study will, as far as possible, arrange their work in history according to the above plan, which has been elaborately discussed in the Report of the Committee of Seven.

TEXT-BOOKS. Within recent years a serious effort has been made to prepare good text-books in history for secondary schools. The text which will be found most satisfactory depends largely upon the school in which it is to be used and the teacher who is to use it. It should not be forgotten that a text which is satisfactory for the first-year class in high school may be unsatisfactory for the third-year class. Each teacher must learn by experience the text which, under given circumstances, is best. In selecting a text for Greek and Roman history, the teacher will do well to examine those of Morey, West, Wulfson, and Myers. For medieval and modern history there are also four very good texts, Robinson, Munro and Whitcomb, West, and Myers. Robinson and Myers begin with the Germanic invasion of the fifth century; Munro and Whitcomb and West begin with the empire of Charlemagne and devote much more space to the nineteenth century than to the earlier periods. There is even a greater number of books to choose from in English history. Coman and Kendall, Larned, Andrews, Wrong, Cheyney, Channing and Higginson or Montgomery may be recommended. All of the books mentioned are furnished with lists of topics and references which enable the student to supplement the text-book work with outside reading of a general or special nature.

SCHOOL LIBRARIES. While it is believed that a text-book should be used for high-school work, it is desirable that every school should have at least a small library of reference books. Atlases are indispensable. For general European history, the best small atlas is Putzger's *Historischer Schul-Atlas*, which has been recently translated into English (Velhagen a Klassig, Leipzig, about seventy-five cents). Labberton's *Historical Atlas* (3800 B. C. to 1900 A. D.,

Silver, Burdett & Co., \$1.25), and Johnson's Half-crown Historical Atlas (Scribner, \$1), are also useful. A new atlas, covering the period from the Roman empire to the nineteenth century, by E. W. Dow, has been announced (Holt & Co.) For English history, Gardiner's Atlas of English History (Longmans, Green & Co., \$1.50) leaves nothing to be desired, besides being of much service for general European history after the fifth century. The student should not only consult atlases, he should have practice in map-making. For this purpose outline maps may be secured very cheaply from the McKinley Publishing Company, Philadelphia, Rand, McNally & Co., Chicago, D. C. Heath & Co., Boston, or Ginn & Co., Boston. Reproductions of great paintings or photographic views of historic places are of some value in the study of history. There are several series of such pictures which may be had at slight expense. The "Perry Pictures" cost but one cent each (Malden, Mass.); the "Cosmos Pictures" about a half-cent each (296 Broadway, N. Y.); the "Soule Photographic Reproductions," Essenwein's *Bilder Atlas*, Vol. II (Leipzig), and Parmentier's *Album Historique*, Vol. I (Paris), are more expensive.

Collections of "Sources" are numerous. Munro's Source Book of Roman History (D. C. Heath & Co.), Henderson's Select Historical Documents (Bell, London), the University of Pennsylvania Translations and Reprints, etc. (six vols., Philadelphia), and Adams and Stephens's Constitutional Documents, may be mentioned.

It is believed, however, that the high-school student can be interested to better purpose in the investigation of special topics in good secondary works, or in reading good biographies. Good biographies, in fact, are plentiful, and comparatively cheap, and a judiciously selected list of such books will probably be found more useful in a school library than anything else. For Greek and Roman history, Plutarch's "Lives" should by all means be secured. For medieval and modern history, Hodgkin's Theodoric, West's Alcuin, Lane-Poole's Speeches of Mahomet, Stephen's Hildebrand and his Time, Lane-Poole's Saladin, Sabatier's St. Francis of Assisi and Mirror of Perfection, Emerton's Erasmus and Villari's Savonarola may be mentioned. There are some very good series of brief biographies for English history that can be secured at slight cost, such as the Twelve English Statesmen Series, Foreign Statesmen Series, etc.

CLASS RECITATIONS. The best text-book, the most fully equipped library, can nevertheless do but little toward insuring success in the teaching of history. Whatever success is achieved will depend ultimately upon the use which the teacher makes of the recitation hour. Aside from occasional written examinations, and

supplementary oral or written reports, the recitation hour should mainly be devoted to developing the subject by means of questions and answers. Simple as it may seem to ask questions, this method, when properly used, requires ability of a high order and produces results which can be achieved in no other way. It is indispensable that the teacher should have sufficient knowledge of the subject to conduct the recitation without reference to the text-book or to notes of any kind. He should have clearly in mind the main topics that he desires to develop and the order in which he wishes to bring them up. Although it is necessary to ask many questions which require mere memorizing of the text, the teacher should always endeavor so to frame the questions that success in answering will depend upon the student's ability to see relations between events. The test of successful questioning consists in the ability of the teacher to lead the student to follow a train of thought based upon a given knowledge of facts, which, left to himself, he would never have followed out. It is hardly necessary to say that the teacher must himself be able to perceive more than lies on the surface, and he should carefully avoid what are known in the courts as "leading questions."

There are no rules for learning the art of successful questioning; success depends upon natural gifts and practical experience. Some very common mistakes, however, may be pointed out. Avoid questions on the one hand that can be answered by "yes" or "no"; on the other hand, generally avoid such as can be answered by memorizing the words of the text. Questions that require thought for an answer should be carefully distinguished from those that require guessing. The teacher must avoid a manner which leaves the impression upon the student that he is being quizzed for the mere purpose of showing up his stupidity or the teacher's cleverness. So far as possible, each question should be determined by the preceding question and the answer which has been given to it. Questions should be frequently asked in such a way that the only hope of a successful answer depends upon having given close attention to the entire recitation. Questions should be short, clear, and precisely worded; the experienced teacher knows by instinct when the student has not understood the question, and when he does not know the answer or seeks to gain time. In a word, such questions should be asked as will (*a*) require accuracy of knowledge, (*b*) test the ability to see relations, and (*c*) demand concentration of attention throughout the recitation.

**SUMMARY.** The department of European history thus desires of students who enter the University of Kansas that they shall at least have a good knowledge of the main facts of some particular

period of European history, and, at best, a good knowledge of the main facts of the entire field; in either case, it desires that they shall have had, in addition, some practice in the use of books, and some training in perceiving fundamental historical relations.

#### AMERICAN HISTORY. *One unit.*

High schools in which the historical courses conform to the recommendations of the Committee of Seven of the American Historical Association will devote the last year to American history. For this course the University provides one unit of entrance credit, but in order to receive credit it must not be given earlier than the third year in the high school. If given earlier in the course, little more can be accomplished than has already been done in the grades. The plan of the American Historical Association contemplates uniting American history and civil government, but it will be found in practice that the work in history will consume the entire year and that instruction in civil government can only be incidental.

In most cases it will be best to base the work in American history upon some approved high-school text. The best high-school texts are Channing's *Students' History*, McLaughlin's *American Nation*, Adams and Trent's *United States*, Montgomery's *Students' History*, and MacDonald's revision of Johnston's *High-school History*. With an adequate reference library and an especially equipped instructor, it may be desirable to carry on the work in American history by the topical method. For this purpose many systematic outlines are available. A very excellent one has recently been published by Supt. Geo. R. Crissman, of the Salina public schools. Even when a text is used, the outline is a useful adjunct, or the outline may be used with several texts in the hands of the class. Courses based upon the outline alone should be approved by the University High-School Visitor. Historical geography is best taught by the aid of outline maps. A systematic series of outline maps, prepared by the department of American history of the University and published by Ginn & Co., illustrates all the territorial changes that have ever taken place in the United States. Where it is impracticable to take time to fill out the whole series, the books may be divided and the maps used separately.

Even with a text-book, a reference library is needed for supplementary reading. Good single volumes for a high-school library are Thwaites's *Colonies*, Eggleston's *Beginners of a Nation*, Parkman's *Struggle for a Continent*, Lecky's *American Revolution*, Burgess's *Middle Period and Reconstruction*, Dodge's *Civil War*, and Stanwood's *History of the Presidency*. The most useful sets are Fiske's *Historical Writings*, Schouler's *History of the United*

States, the American Statesman Series, Hart's American History by Contemporaries, and MacDonald's Charters, Documents and Statutes Illustrative of American History. With a text, this number of books will furnish ample supplementary reading, but for the library method it should be regarded as a minimum.

### MATHEMATICS. *Three units.*

The requirement in mathematics for admission to the College of Arts and Sciences of the University of Kansas consists of one and one-half units of elementary algebra, and one unit of plane geometry. In the School of Engineering, an additional half-unit of solid geometry is required.

An additional half-unit of plane trigonometry and a half-unit of advanced algebra will be accepted by the University from such of its accredited schools as the High-School Visitor may certify are properly equipped to teach these courses.

Detailed accounts of the topics required and the suggestions as to the methods of teaching the various subjects are given below.

**ELEMENTARY ALGEBRA.** *One and one-half units.* The textbook in Algebra adopted for the use of the Kansas schools is Wentworth's School Algebra. Since this book contains a larger amount of algebra than the average class can master in a year and a half under present conditions, some portions of it must be omitted, and it becomes necessary for the University to specify definitely just what portions may be omitted and just what portions must be mastered by the pupils in order to fulfil its requirements for admission.

This task is most easily accomplished by enumerating the paragraphs, exercises and chapters which may be omitted, and yet the pupils be fully prepared to enter the University classes. In this way the University lays down the essential things and the minimum amount of algebra which the preparatory schools must teach, but leaves them free to select such other topics as their time and local conditions may permit. But it is recommended that the high schools omit these designated topics and chapters from their course, and drill their pupils more thoroughly in the required topics.

Wentworth's School Algebra contains excellent lists of exercises, which are generally well graded. Occasionally the author introduces problems and exercises which are too abstract for beginners, and should therefore be omitted.

These omissions and other suggestions are given in the following notes in the various chapters :

*Chapter I.* Note 1.—As remarked in the preface, this chapter

should be read and *discussed* in the recitation-room, and no attempt should be made to have the pupils *recite* it. Positive and negative numbers should be explained and illustrated graphically, as on pages 17-19. The rules of signs in multiplication and division should be learned, but beginners will neither appreciate nor profit by an abstract proof of them. The real work of the pupil should begin with the exercises on the removal of parenthesis, and with addition and subtraction.

*Chap. II.* Note.—The vinculum is practically never used in mathematical work ; therefore omit examples 16-20 in exercise 6.

*Chap. III.* Note.—Omit examples 37-40 in exercise 10 ; and 16 and 17 in exercise 12.

*Chap. IV.* Note.—Omit examples 42 and 43 of exercise 14, and all of exercise 16.

*Chap. V.* Note.—Solve every problem in this chapter.

*Chap. VI.* Note 1.—Omit all of article 109 and exercise 26.

Note 2.—Chapters II, III, IV and V are so elementary in their character and so suitable for younger pupils that they may well be taught in the grammar-school. The practical use and the disciplinary value of the methods of chapter V are worth more to the pupil than all the compound proportion, bank discount, cube root, etc., that are contained between the covers of the old arithmetics. The notion that all problems in the schools and in school examinations should be “solved by arithmetic” is inexcusable pedantry.

*Chap. VII.* Note.—The chapter on factoring is of fundamental importance and should be thoroughly learned.

*Chap. VIII.* Note 1.—This chapter contains two distinct methods for finding the highest common factor, and two corresponding methods for lowest common multiple. Case I, viz., the method by factoring, is the only one that the ordinary student of mathematics will ever be called upon to use in his subsequent work. This method is easy, and should be mastered.

Note 2.—The method given in case II is out of place in a course in elementary algebra for the following reasons :

(1) The proof of the method is too abstract and difficult for beginners, and is practically never mastered by them. Its proper place is in advanced courses of mathematics, in the University.

(2) The pupil does not need it in his subsequent work, and may pursue the science of mathematics to the end of his university course and never have occasion to use it except on artificial problems manufactured especially for the occasion.

Note 3.—Omit articles 139-146, exercise 39, article 151, and exercise 42.

*Chap. IX.* Note.—Omit example 5, article 155, and examples 28–35 in exercise 43. These are specimens of the artificial problems mentioned above. Omit example 3, article 168, and examples 14–17 in exercise 51. The rest of the chapter on fractions should be thoroughly mastered.

*Chap. X.* Note.—Articles 173–179 may be omitted at the discretion of the teacher.

*Chap. XI.* Note.—The use of “squared paper” and of graphical methods should be taken up in connection with this chapter. The pupil should now be taught to use coordinate axes, to “plot” points, to construct the “graph” of a first-degree equation in one and two variables, and to obtain graphically the solution of a pair of simultaneous linear equations. (See *Graphical Algebra for High Schools*, by H. B. Newson, published by Ginn & Co.)

Note 2.—Solve graphically the problems in exercise 58.

*Chap. XII.* Note.—Omit articles 195–197.

*Chap. XIII.* Note.—Do not spend much time on this chapter.

*Chap. XIV.* Note 1.—Special attention should be given to the binomial theorem contained in articles 210–212. Solve all the examples in exercise 69. (See note to chapter XV.)

Note 2.—Special attention should also be given to the finding of arithmetic square roots.

Note 3.—Omit all of cube root.

*Chap. XV.* Note.—In connection with the examples 29–34 of exercise 77, the pupils should solve examples 1–27 of exercise 112. This will meet all the requirements of the University on the binomial theorem.

*Chap. XVI.* Note.—Omit articles 257–261.

*Chap. XVII.* Note.—An understanding of imaginary expressions as treated in this chapter is essential, but many believe that it should be taken up after the quadratic equation has been studied. Its significance will then be better understood. See note 1 to next chapter.

*Chap. XVIII.* Note 1.—It is believed that the order in which the topics in this chapter and allied topics are taken up can be improved. The following order of topics is suggested: (1) The pure quadratic, articles 275–279; (2) the method of factoring, article 286, and numerous examples selected from exercises 34 and 35; (3) the method of completing the square by first dividing by the coefficient of  $x^2$ , article 280, and exercise 94; (4) literal quadratics, article 285; (5) solution by the formula, article 287; (6) properties of quadratics, chapter XX; (7) imaginary expressions, chapter XVII; (8) equations in quadratic form, articles 288, 289; (9) equations

containing radicals, articles 290, 291; (10) problems involving quadratics, article 292; (11) simultaneous quadratic equations, chapter XIX.

Note 2.—The method of factoring should be presented early, in order to show the character of the problem and the existence of the two roots. The pupil should clearly understand that relatively few simple problems are solvable by the method of factoring.

Note 3.—In order to avoid confusion of methods, it is best that the beginner be taught but one method of completing the square of a quadratic equation. Experience has shown that the method of completing the square after dividing through by the coefficient of  $x^2$  is the easiest for the pupil to remember. This method should therefore be taught, to the exclusion of all others.

Note 4.—After the pupil has been thoroughly drilled in the above-mentioned method of completing the square, he should be taught the formula of article 287. He should be convinced by numerous examples that the quickest way to solve a quadratic equation is to use the formula. The pupil should habitually use the formula in his subsequent work whenever he has a quadratic equation to solve.

Note 5.—The theory of the quadratic equation as discussed in chapter XX should be illustrated by the graphical method. Graphs should be constructed of quadratic equations, illustrating all possible combinations of roots; *e. g.*, both roots positive, both negative, one positive and one negative, one zero and the other positive or negative, both roots equal, roots imaginary, etc. The clear understanding thus gained more than compensates for the time required to learn the graphical method.

Note 6.—Omit articles 281–284, except exercise 94.

*Chap. XIX.* Note 1.—Omit article 295, and examples 37–42 of exercise 101.

Note 2.—The pupils should be taught to construct the graphs of equations of the second degree in two variables. These equations should be so chosen that their graphs will lead to the circle, ellipse, parabola, hyperbola. Solve graphically examples 1–18, 33–36, 54–58, of exercise 101.

*Chap. XXI.* Note.—Omit articles 322–326 and articles 329–337, and exercise 106. This chapter should be read in connection with pages 90–97 of book III of Phillips and Fisher's Geometry.

*Chap. XXII.* Note 1.—In arithmetical progression, omit examples 3 and 4 of article 343, article 345, and examples 11–30 of exercise 107. In geometrical progression, omit articles 350, 352, and examples 3–9 of exercise 108. Omit all of harmonical progression.

*Chap. XXIII.* Note.—Omit all the chapter.

*Chap. XXIV.* Note.—Omit all the chapter except exercise 112. (See note to chapter XV.)

*Chap. XXV.* Note.—Omit all the chapter. This chapter should be studied in connection with the course in trigonometry.

PLANE GEOMETRY. *One unit.* The text-book in geometry recently adopted (May, 1904) for use in the high schools of Kansas in Phillips and Fisher's Elements of Geometry, abridged edition. The change to this text from Wentworth's book necessitates some changes on the teacher's part in methods and in subject-matter, though for the most part the course in geometry in the high schools of Kansas is not greatly altered by this change in books.

While the former book was so large that it was almost impossible to solve all the problems in it in the allotted time, the present text-book is much smaller, and the number of exercises is so much reduced that all the book contains on plane geometry may easily be completed in one school year. Some schools and teachers will doubtless be able to complete books I-VI in one year, leaving books VII-IX to be completed in another half-year. The miscellaneous exercises on pages 333 and 334 should be taken in connection with the specific books they are intended to supplement, and not left until the end of the course.

One of the chief difficulties with which both teachers and pupils have to contend in the ordinary course in high-school geometry is that the pupils are called upon to acquire at one and the same time the elementary ideas of geometry, the terminology of geometry, and a knowledge of the nature and meaning of a logical proof. This difficulty would be largely overcome if these tasks were separated, so that the pupil could acquire his geometric ideas and vocabulary a year or more in advance of his undertaking the study of demonstrative geometry.

*Concrete Geometry in the Grades.* As long ago as 1892 the Committee of Ten, influenced by the mathematical curriculum of the schools of continental Europe, recommended that systematic instruction in concrete (intuitional, non-demonstrative) geometry be given in the grammar grades. (See the Report of the Committee of Ten.)

Besides the above-mentioned difficulty in the teaching of the ordinary course in high-school geometry, there are weighty reasons for the introduction of some elementary geometry in the grammar grades. A very large percentage of the children in these grades never reach the high school. From their ranks is largely recruited the army of mechanics and skilled laborers of all kinds. A knowledge of the simpler facts of geometry is extremely useful in after-life to large numbers of people of this class. The public-school

system should therefore be adapted to their needs and they should be given an opportunity to acquire in their school days this useful knowledge.

Concrete geometry is in its nature less abstract than many of the arithmetical theories usually taught in these grades, and is therefore better suited to the immature minds of the pupils than the more difficult processes of analysis which make up so large a part of the course in arithmetic.

It may be objected that the above suggestions are innovations which are contrary to the traditional course in geometry in American and English schools; but the experience of continental Europe has established its practicability so thoroughly that its superiority to the common method cannot be denied. The same thing is being done in many schools in this country with absolute success.

A few words on the various methods of introducing this study into the grammar grades.

*Blocks and Models.* Mensuration is not the last topic that should be taken up in the course in arithmetic, but work on this subject should be carried on throughout the seventh and eighth grades. A good set of geometrical blocks and models can be used here with great profit to the pupils. Such a set can be purchased for a small amount. (One of the best sets on the market is sold by W. D. Ross, Fremont, Ohio, for \$12.)

The amount of geometrical knowledge to be acquired from such a set of blocks, or from the subject of mensuration illustrated by blocks, is a good preparation for high-school or demonstrative geometry.

*Geometrical Drawing.* Closely connected with concrete geometry on the one hand, and on the other associated with the manual-training idea, is the subject of geometrical drawing. This might be taken up in connection with the work in free-hand drawing or in manual training. All the essentials of the course in concrete geometry advocated above might be given in a course in geometrical drawing.

The necessary outfit is very simple; the pupil should provide himself with a pair of compasses, a ruler, a protractor, and a small drawing-board. The following sample outfit will be found very satisfactory:

The Eagle compasses, No. 569, price twenty-five cents.

A hardware ruler with inches and fractions on one edge and centimeters on the other edge, five cents.

A German silver protractor, twenty-five cents; paper ones, thirty cents a dozen.

The Springfield drawing kit, thirty cents. (Western agents, Hoover Bros., Kansas City.)

Pupils soon acquire dexterity in the use of these simple tools, and through their proper use soon accumulate a large fund of useful geometrical knowledge.

*Problems of Construction.* These tools should be used in connection with the ordinary course in high-school geometry, no matter whether the pupils have previously learned their use or not. Every problem of construction in Phillips and Fisher's geometry should be carefully drawn on suitable paper and as accurately as the tools at hand will permit. With the simple outfit described above a very high degree of accuracy may be obtained. It is not enough for the pupil to learn the theory of geometrical construction; he should also be taught how to apply the theory to actual practice. For example, it is not sufficient that the pupils be able to *tell* how to construct a square equivalent to the sum of two given squares, but they should be able to do it and do it accurately and neatly. The accuracy of the result should be verified, whenever possible, by actual measurement. In the chemical or physical laboratory it is not regarded as sufficient that the pupils are able to tell how to do a certain thing; they must be able to do it. It should be the same in geometry.

*Text-books in Elementary Geometry.* There are a number of text-books in concrete geometry on the market intended for the use of pupils in the grammar grades; a few of these are mentioned here. These books may be obtained from the publishers. Baker's Elementary Geometry, Ginn & Co.; Nichol's Introductory Geometry, Longmans, Green & Co.; Hornbrook's Concrete Geometry, American Book Company; Campbell's Observational Geometry, American Book Company; Dodd and Chace, Elements of Algebra and Geometry, Kimberly Publishing Company, Kansas City, Mo.; Hailmann's Constructive Form Work, P. C. Burchard & Co., Boston, Mass.

The last one mentioned is the best for young children in the lower grades. Baker's little book is one of the best of its kind for more advanced pupils, and is well adapted for the upper grammar grades of the first year of the high school.

**SOLID GEOMETRY.** One-half unit. Solid geometry, one-half unit, is [required for entrance to the School of Engineering, but is not required for entrance to the College of Arts and Sciences. If not offered for entrance to the College, it must be taken in the first term of the Freshman year. All accredited schools teach solid geometry, and so it is recommended that, as far as possible, candidates for admission to the College offer solid geometry for entrance.

All of Phillips and Fisher's Solid Geometry, including the miscellaneous exercises at the end of the text, must be taken by the

pupil in order to meet the requirements for entrance to the School of Engineering.

In connection with the course in solid geometry the use of blocks and models is urged, and accurate drawings should be strongly insisted on. In this connection it will be found useful to have the pupils construct cardboard models of as many of the solids studied as is possible. Patterns for a large number of these models are to be found in Campbell's *Observational Geometry* (American Book Company.)

#### FOURTH-YEAR MATHEMATICS..

At present only a few high schools in Kansas give courses in trigonometry or college algebra. Hereafter plane trigonometry and college algebra, one-half unit each, may be offered for entrance and counted among the fifteen units required for entrance. It is expected that this privilege will stimulate most of the stronger high schools of the state to introduce these courses into their curricula. Where both are taught, trigonometry should precede college algebra.

**PLANE TRIGONOMETRY.** One-half unit. The course in plane trigonometry should follow the outline printed in the University catalogue. Any good modern text-book will do. Problems should be solved by use of the tables of natural functions before logarithms are introduced. The study of the theory and use of logarithms should be taken up in connection with the trigonometry at the time it is needed.

**COLLEGE ALGEBRA.** One-half unit. The term "college algebra" in the past has stood for the most indefinite thing in the whole mathematical curriculum of American schools. The lists of subjects in the various text-books on college algebra bear evidence to the same fact. The recent action of the joint committee mentioned in the University catalogue under "Entrance Requirements in Mathematics" has done much to standardize this course.

A half-unit of college algebra, to be accepted by the University, must conform as closely as possible to the outline printed in the University catalogue. The topic, *permutations and combinations*, may be omitted at the discretion of the teacher. All subjects involving infinite series should be omitted and the stress chiefly placed on complex numbers, determinants, the theory of equations, and their application.

In the solution of numerical equations, the roots should be located by means of the graph and their approximate values found by Horner's method. Sturm's theorem should not be given. The algebraic solutions of the cubic and quartic may be included if time permits, but they are not required.

GENERAL REMARKS. The modern tendency in mathematical instruction in secondary schools of the country is toward unification of the various branches of the science and its correlation with allied sciences. The teacher should always hold in mind that arithmetic, algebra and geometry are not separate sciences, but closely connected branches of one science, viz., mathematics. The arithmetic, algebra and geometry should be intermingled as intimately as possible. Many problems of algebra should be geometrical in character, and many problems in geometry should be solved by algebra. The unity and not the divergency of the science should be emphasized. In the high-school course mathematics and physics have contact at many points, or, rather, they interpenetrate each other in many regions. Both should be taught in such a way as to emphasize this relationship.

The order in which the subjects are taught must be governed by local considerations. As matters now stand in most Kansas schools, it is believed that the best temporary arrangement is as follows:

First year.—Algebra to quadratic equations or thereabouts.

Second year.—Plane geometry.

Third year.—Algebra with required work completed, and solid geometry.

Fourth year.—Plane trigonometry and college algebra.

## Physical Geography.

### THE EARTH.

#### REFERENCES.

1. Davis, Physical Geography, pp. 8-17 (edition of 1899).
2. Gilbert and Brigham, Physical Geography, pp. 1-27.
3. Chamberlin and Salisbury, Geologic Processes, vol. 1, pp. 2-5.

- A. The earth as part of the universe.
  1. The universe is made up of millions of systems, of which our solar system is one.
  2. The earth is one of the planets of our solar system, which comprises the sun and the planets.
- B. The relation of the earth to the sun.
  1. Distance from sun, 92.9 million miles.
  2. Revolves around the sun once in 365 $\frac{1}{4}$  days.
  3. The mass of the earth is only  $\frac{1}{333,000}$  of the mass of the sun.
  4. The earth depends upon the sun for its heat and light.
- C. The relation of the earth to the other planets.
  1. The planets of our solar system are: Neptune, Uranus, Saturn, Jupiter, Mars, Earth, Venus, Mercury.
  2. Which of the planets are nearer the sun than the earth is?
  3. Some of the planets revolve more rapidly around the sun, some more slowly, than the earth does.
  4. Some of the planets rotate more rapidly, some less rapidly, than the earth does.
  5. Neptune, Uranus, Saturn and Jupiter are larger than the earth; the other planets are smaller.
- D. The shape of the earth.
  1. Early conception that the earth was flat.
  2. A globe or spheroid. Proofs of:
    - a. Greeks in the fourth century found that in traveling a few hundred miles northward new stars came into sight over the northern horizon, and that stars that had been in sight over the southern horizon could no longer be seen.
    - b. "The earth must be a sphere, because when the earth's shadow falls on the moon, causing an eclipse, the edge of the shadow is a curved line." (Aristotle.)
    - c. The earth can be circumnavigated. (*Note.*—This does not prove that the earth is a sphere, but merely that it has curved surfaces.)
    - d. Ships leaving an island in different directions and at the same rate disappear together. If this be true from all points, it would show sphericity.
    - e. How is the oblateness shown? By increase of distance traveled to make the north star rise one degree.

E. The size of the earth.

1. How determined?

- a. By measuring the curvature of the earth. (See Davis's Physical Geography, appendix B, p. 386.)
- b. By traveling around the earth and making measurements. (The diameter of the earth is about 8000 miles; the distance to either pole from the center is about thirteen miles less than from the center to the equator.)

F. The motions of the earth.

1. Revolution around the sun. Earth goes around sun once in  $365\frac{1}{4}$  days; i. e., once a year.
2. Rotation on its axis.
  - a. Direction of rotation from west to east. Proof: Body dropped from a tower is deflected to the east.
  - b. Results of rotation—day and night. (Sunrise and sunset suggest a natural system of directions.)
3. Results of the inclination of the axis combined with the annual revolution.
  - a. Changes in the length of day and night.
  - b. Seasons: Deal first with two seasons, in summer more hours of heating than in winter; difference in apparent elevation of the sun in summer and winter; obliquity of rays. Later, show hypothetical cases of inclination; show effect of rotation without revolution; also of revolution with the axis fixed away from and toward the sun.

G. Latitudes and longitudes.

1. What are they? How established?
2. Uses of.
  - a. In locating points on the surface of the earth.
  - b. In mapping. (Note.—See appendix C, Davis's Physical Geography, p. 388.)

## THE ATMOSPHERE.

### REFERENCES.

1. Davis, Physical Geography, pp. 18-56.
2. Gilbert and Brigham, Physical Geography, pp. 223-273.
3. Chamberlin and Salisbury, Geologic Processes, vol. I, pp. 5-7.

A. Is the atmosphere part of the earth or an envelope? (Mass of the air is  $\frac{1}{1200000}$  of that of the earth.)

B. Height of the atmosphere, how determined?

1. By means of falling meteorites. They give height of at least 100 miles.
2. *Aurora borealis*. Height 600 miles.
3. The determination of the sphere of gravitative control of the earth gives 620,000 miles as the outside limit of the atmosphere.

**C. Constituents of the atmosphere.**

1. Nitrogen—it is a dilutant; it has mechanical effects in connection with the wind; it influences pressure; diathermous to heat.
2. Oxygen—supports animal life and combustion; diathermous to heat.
3. Carbon dioxide (about 4 parts in 10,000).
  - a. Sources of—animal life, and combustion, expiration, and vulcanism.
  - b. Uses.
    1. Plant life.
    2. Weathering.
    3. Absorbent of heat.
  - c. Is there more carbon dioxide in the air in winter than in summer? Plants use less, combustion of fuel is greater, decay is less, winds would blow it away. The result is not known, but it is said that there is more over cities in the winter than in the summer.
4. Dust.
  - a. Effects of.
    1. Causes condensation of vapor.
    2. Diffusion of light.
    3. Colors of the sky. The bright sunset after the volcanic explosions of Krakatoa in 1883 were due to dust in the air.
  - b. What keeps the dust in the air?
    1. Currents.
    2. Friction of the air.
    3. Possibly electrical conditions.

**D. Is air a mixture or a chemical compound?****E. The heat of the atmosphere.**

1. What is heat? The movement of the molecules; temperature is the measurement of impact.
2. How is heat transmitted?
  - a. By conduction. The molecules retain their relative positions.
  - b. By convection.
    1. By expanding and lifting overlying column.
    2. Lateral motion, leveling the surface; then the molecules at the side are under a greater pressure than those at the center, and there is motion at the bottom toward the center, and then upward in the center. In convection the molecules change their relative positions.
  - c. By radiation. Radiation is a wave motion of the molecules of the ether.

3. The thermometer.
  - a. Principle of.
  - b. Why take  $32^{\circ}$  below freezing as zero? (This was the lowest temperature obtainable from a mixture of snow and ice.)
  - c. Why not use fractions of an inch on a thermometer tube instead of degrees? Because tubes are not uniform in bore.
4. Isothermal lines.
  - a. What?
  - b. Variable or not?
  - c. If latitude alone affected temperature, what should be the relation between isotherms and parallels? (Identical.)
5. What are the factors influencing temperature?
  - a. Latitudes.
  - b. Land and sea. (Land is colder than the water in winter but warmer in summer.)
  - c. Prevailing winds.
  - d. Altitude.
6. Why are high altitudes colder than low altitudes?
  - a. Freer radiation.
  - b. Less carbon dioxide.
  - c. Less dust.
  - d. Freer circulation of winds.
  - e. Rarer air, which circulates more freely.
  - f. Less moisture.
7. What influence annual range of temperature?
  - a. Latitude.
  - b. Nearness to sea.
  - c. Moisture.
  - d. Altitude.
  - e. Direction of winds. (The greatest range is in north-east Siberia.)
8. What influence the daily range of temperature?
  - a. Length of day.
  - b. Latitude.
  - c. Altitude.
  - d. Nearness to sea.
  - e. Moisture.
  - f. Vegetation. (Its absence allows greatest range.)
  - g. Color of soil. (Black gives greatest range.)
  - h. Time of year. (Note.—Length of day alone considered, we should get greatest range when day and night are equal; latitude alone considered, the greatest range should be when the sun is near its zenith. In the Sahara, range is as much as  $70^{\circ}$  F. per day.)

**F. The pressure of the atmosphere.**

1. How is its existence proved?
2. Amount of pressure—how measured?
3. Principle of the barometer. How high must we go above the sea-level to have mercury drop one inch? (About 1000 feet.)
4. Is pressure constant at any point? What affects pressure? (When air is heated it rises and lifts the air above it into a dome; the upper areas are domed more than the lower ones, due to their expansion; convection currents are set up, since the pressures differ.
5. Importance of differences of pressure.
  - a. Cause winds. (What are isobars? What kind of pressure at the equator?)

**G. The moisture of the atmosphere.**

1. Evaporation takes place from all moist surfaces; molecules from the surface of the water fly off from collision. Increase of temperature causes more rapid motion, and hence more rapid evaporation. Possibly there is evaporation at all temperatures above absolute zero. Evaporation is more rapid under low pressure. Further evaporation is retarded by molecules of water vapor already evaporated.
  - a. Upon what does the rate of evaporation depend?
    1. Temperature.
    2. Pressure.
    3. Humidity.
    4. Winds.
  - b. When will evaporation from a surface cease? (When as many molecules are caught in the water surface as are given off—a condition of saturation. If the temperature be then increased evaporation may go on again.)
2. Relative humidity—depends on temperature.
3. Absolute humidity—the absolute amount of water vapor in the air.
4. Condensation.
  - a. Relative importance of evaporation and condensation? They balance each other. Evaporation is greater in low latitudes than in high, and greater over oceans than over lands; condensation is greater over coastal than over inland regions; greater in mountains than on plains. The amount condensed on the surface of the earth each year is enough to cover France (20,000 square miles) one mile deep.
  - b. Conditions for condensation.
    1. Sufficient humidity over saturation.
    2. Dust particles.

c. Forms which the condensed water vapor takes.

1. Dew. (a) Dew-point? (b) Dew neither rises nor falls. (c) How formed? Air becomes saturated by falling of the temperature and vapor is condensed. (d) Effect of condensation of vapor. Heat is liberated—the condensation of one pound of water liberates enough heat to melt five pounds of iron. (Explain.) This liberation of heat will prevent the surrounding air from falling below the condensation point. (e) Dew on clear *versus* cloudy nights? (f) Dew on windy *versus* still nights?

d. Frost.

e. Fog.

1. What? Condensed water vapor near the earth and which has not fallen; it is in very fine particles.
2. Does fog occur more frequently over land or over water in winter?
3. Reason for fogs southeast of Newfoundland?
4. Fogs in valleys or on hills? Why?
5. Is fog evaporated from the top or from the bottom? Some evaporated first from the top, but rays of the sun pass through and are radiated and evaporate the lower part of the fog.
6. Reasons for fogs over lakes, etc.? (Cooler air comes down from the land over the water and cools the air to saturation point.)

f. Clouds.

1. What? Condensed vapor at some elevation.
2. Cloud banner. (a) How formed? (As winds ascend a mountain side the pressure becomes less and the air is cooled as it expands and becomes saturated and a banner is formed.) (b) Why does it not grow indefinitely? (Water particles are settling and as they reach warmer air they are evaporated.)
3. Classes of clouds. (a) Nimbus. Height, about a mile; cloud from which precipitation is occurring. (b) Stratus. In layers, because they are low and we see the edges; height, about one-half mile. (c) Cumulus. Banks three-fourths to one and one-fourth miles in height. How formed? Bottom is horizontal. These clouds often grow smaller and disappear in the evening because upward currents tend to stop and particles fall below the level at which they remain condensed. (d) Cirrus. Height, five to six miles; condensation probably occurs below  $32^{\circ}$  at high altitudes, and so ice crystals form.

G. The moisture of the atmosphere—*continued*:4. Condensation—*continued*:

## g. Rain.

1. Causes of? Saturation of the air by taking to colder air or bringing colder air to it; air may be cooled by taking to higher latitudes or to higher altitudes.
2. Of what are clouds from which the rain comes composed? Dust and tiny water drops. (a) How kept up? By air currents. By friction of the air. (b) Are the water particles larger higher up or nearer the surface? At which level are there more dust particles? Near the surface dust particles more plentiful, and hence the water particles will be larger higher up where the dust particles are fewer. (c) What conditions favor the largest drops? Few dust particles. High humidity in the air beneath. Still air. (d) Under what conditions may rain-drops fall from a clear sky? Air may be cooled and become supersaturated; if few dust particles are present large drops may form and fall without forming clouds.
3. Effect of rain on the air? Takes out dust. Dissolves out gases—carbon dioxide chiefly. Washes out organisms, inorganic particles, etc.
4. Effect of rain on soil? Adds dust. Rain may bring dust from all parts of the world.
5. Blood rains caused by red dust, carried chiefly from the Sahara.

## h. Snow.

1. Relation of snow to rain? Snow is crystallized water vapor; above a plane of  $32^{\circ}$  above zero snow will form; below it, rain.
2. Is the plane of  $32^{\circ}$  constant? It is higher in lower latitudes in summer; varies with air currents. In falling, snowflakes may be increased or decreased, or may evaporate entirely.

## H. General circulation of the atmosphere.

1. What is wind? Air in motion along the surface.
2. Immediate cause of winds? Difference in pressure; air moves from places of high pressure to places of low pressure.
3. Ultimate cause of wind? Differences in temperature; the higher the temperature the lower the pressure. Increase of humidity also decreases pressure.
4. Strength of wind? Depends on difference of pressure per unit of distance, *i. e.*, the barometric gradient. "One gradient" means a difference of pressure of 0.01 inch for seventeen miles. Velocity is dependent also on friction, trees, mountains, etc. Velocity should be greatest, *ceteris paribus*, on seas as against lands; above ground rather than on the ground.

## 5. Classes of winds.

a. Trade-winds. The temperature in low latitudes is greater than in high latitudes; hence lower pressure, due to air expanding, lifting the air above and moving away horizontally. The first horizontal currents will be aloft, not at the surface. Pressure will be increased nearer the poles, decreased near the equator, and will be highest near the tropics, near  $30^{\circ}$ . Air will move from the place of highest pressure equatorward, but will be deflected southwest in the northern hemisphere and northwest in the southern. The trade-winds blow to the heat equator, not to the geographic equator. The heat equator is further from the true equator in the northern hemisphere, as there is more land in this hemisphere than in the southern hemisphere.

b. Doldrums. Belts of calms in the equatorial region.

c. Antitrade winds. Waldo holds that since the meridians converge there will be congestion of the air at  $30^{\circ}$  and the pressure will be relieved to the north. This relief will cause winds to blow—winds which get the name of the westerlies, or antitrade winds. They are not very definite north of latitude  $60^{\circ}$ . The calm belt over the tropics is called the “tropical calms,” or the “horse-latitude calms,” from the loss of horses shipped from New England to the West Indies. (*Note.*—The conditions mentioned in connection with the above winds are not always followed, because of differences of temperature and pressure with different seasons. In Asia there are monsoons; in America there are winds from the Gulf in the summer and from the north in winter. There is a seasonal migration of the wind belts. Over any place in the trade area this shift may bring in the westerlies. The trade-winds blowing from cool to warmer latitudes will be dry, the others wet.)

## 6. Interference with the general circulation of winds. By—

a. Secondary circulation.

b. Unequal heating of land and sea.

c. Inequalities of land surface. The rainfall on the western coast of North America from the westerlies is greatest in winter, as the land is cooler. As winds strike the mountains they rise, pressure becomes less; therefore the temperature falls, and if the temperature falls below the dew-point rain falls. As the winds pass down the other side of the mountain the pressure increases, temperature rises, and no rains fall. In eastern United States most rain comes from the Gulf of Mexico. In South America heavy precipitation on east side of the Andes in central part; in the southern part the rainfall is chiefly on the west side. In England more rain on the west than on the east side. Sahara is dry because of hot trades from the northeast.

H. General circulation of the atmosphere—*continued*:

## 7. Results of interference with the general circulation.

## a. Cyclones.

1. What? A large inward, upward whirl of air.
2. Pressure? Very low in center, increasing outward.
3. Moisture.
4. Temperature. Warmer in the south and southeast, as the winds are from the southwest. The temperatures may differ  $40^{\circ}$  to  $50^{\circ}$  on the two sides. In general, a cyclone center means relatively high temperatures, as the warm winds going to cooler areas may lose their moisture.
5. Winds. At the surface they move from right to left; above they move outward in the opposite direction. They increase in speed as they approach the center; blow faster on south or southeast sides in our latitudes, owing to the influence of the westerlies.
6. Movements of storms. Move in the direction of the prevailing winds; in the United States, toward the northeast, average  $10^{\circ}$  to  $12^{\circ}$  north of east. They move twenty-eight to thirty miles per hour.
7. Origin. (a) Local unequal heating; an eddying movement is assumed by the effect of the earth's rotation; this is right-handed. (b) Whirls at the margin of wind belts.
8. How are cyclones maintained? By release of lateral heat through condensation of moisture. The cyclones which reach Siberia die out from lack of moisture to keep them up.

b. Anticyclones. Outward moving whirls with high pressure within. Winds are usually not strong, but light and fluctuating. As the air settles it becomes under greater pressure and gets warmer, and clear skies generally accompany these storms. As the deflective influence of the earth's rotation is toward the right hand, an outward spiral movement in this direction results. Dew and frost are most likely to occur when an anticyclone is over a place.

## c. Hurricanes.

1. Compare with cyclones. Smaller than cyclones; often shorter lived, but often they come northward and become cyclones. Winds are blowing much more violently toward the center, and pressure is much lower than in cyclones; usually the rate is eight to ten miles an hour. At the center is a clear sky, "the eye of the storm."
2. Kind of movement. Inflow at the surface; ascent at the center; outward flow above.

3. Occurrence of. Usually six to ten miles of the equator; the deflective influence of the earth's rotation not great enough nearer the equator. They are unknown in the South Atlantic because there are no islands there.
  4. Time of occurrence. Midsummer, in the West Indies—July to October; they never start over the continents, but always over oceans. The air over islands becomes heated and whirls start.
  5. Direction. A storm starting in the southern part of the North Atlantic would move northwest, due to the influence of the trades moving southward and the upper winds. Presently it would come within the influence of the westerlies and move northeast. Hurricanes occasionally start in the islands south of India. These start west, are deflected southward, and, in the region of the antitrades, are changed to the southeast.
- d. Tornadoes.
1. What? A cyclone of small diameter, high gradient, and circular motion.
  2. When? In the late afternoon in the late spring and summer.
  3. Size? About twenty-five miles by one-fourth mile.
  4. Movement. Northeast in the southeast part of a cyclone area; velocity, 35 to 40 miles per hour. The air circulation is the same as in a cyclone; a funnel-shaped cloud. As the whirl goes on it increases in violence and the dew-point may be reached at lower and lower levels, and hence the funnel grows downward.
  5. Destruction. Buildings in the center have air under greater pressure than that outside, and hence walls are blown out. Buildings farther from the center are blown down by the whirl.
  6. Causes of tornadoes. The wind in the southeast quadrant of a cyclone comes from the southwest and is warm. Cooler air comes into the warm area from the northwest. There will then be cool dry air over warm air—a very unstable condition, which causes a whirl.
- e. Cloudbursts.
1. What? Local. Very rapid condensation, of short duration.
  2. Cause? Rapid condensation kept up by upward currents over low-pressure areas; when currents cease water falls.
  3. Where? In dry regions.

H. General circulation of the atmosphere—*continued*:7. Results of interference with general circulation—*continued*:*f.* Periodic winds.

1. Monsoons.
2. Land and sea breezes.
3. Mountain valley breezes.

*g.* Miscellaneous winds.

1. Hot winds associated with cyclones.
2. Cold winds associated with anticyclones.
3. Chinook winds. Winds from the Pacific blowing over the mountains lose their moisture and become heated on the east side, and blow as dry, warm winds. They are important east of the mountains to the north and to the south of the United States. They make much land valuable which would otherwise be valueless.

*h.* Effects of winds.

1. Distribution of temperature.
2. Distribution of moisture.

## 8. Climate.

*a.* What? The average meteorological conditions of an area for a long time.*b.* Elements?

1. Temperature.
2. Wind.
3. Moisture.

*c.* Factors affecting climate.

1. Nearness to sea.
2. Latitude.
3. Altitude.
4. Winds.
5. Topographic relations.

*d.* Climate zones—bases for?

1. Mathematical—latitude.
2. Isotherms.
3. Moisture.
4. Winds. The best basis is the one which brings together those places which have most uniform conditions. Probably winds form the best basis in use.

*e.* Divisions of climate in the north temperate zone.

1. Moist and dry.
2. Equable and variable.
3. Interior and coastal.
4. Low and high altitudes.

f. Weather.

1. What? Weather signifies meteorological conditions of a limited period.
2. Maps. Weather maps are made at eight A. M., Washington time. Observations are made at 165 stations in the United States, twenty in Canada and four or five in the West Indies. Reports are sent to all stations, and maps are made showing temperature, pressure, direction of winds, changes in the last twenty-four hours, giving isothermal and isobaric charts.
3. Value of weather maps. (a) To sailors: Valuable cargoes are often kept in the harbor, owing to the warning. (b) To railroads: All freights leaving Pittsburg, west, are made up on the basis of Cox's forecast. Trains are made up in winter in three classes, heavy, medium, light, according to the amount of snow on the track. (c) To fruit shippers: Three million dollars' worth of fruit saved one winter because of forecast of cold wave.

## OCEANS.

### REFERENCES.

1. Gilbert and Brigham, *Physical Geography*, pp. 279-301.
2. Davis, *Physical Geography*, pp. 57-90.
3. Chamberlin and Salisbury, *Geologic Processes*, pp. 309-374.
4. Thompson, *Voyage of the "Challenger,"* 2 vols.
5. Thompson, *Depth of the Sea*.
6. Barker, *Deep Sea Soundings*.
7. Wyld, *Thalassa*.
8. Shaler, *Sea and Land*.

- A. Distribution. Cover seventy-two per cent. of the earth's surface. The area of the oceans is about 143,000,000 square miles; the area of the ocean water on the continental shelf is about 10,000,000 square miles; the larger part of the oceans lies in the southern hemisphere.
- B. Depth. The average depth is 12,000 to 15,000 feet. The average elevation of the land above sea-level is about 1375 feet. If the surface of the earth were made smooth the waters would cover it to a depth of two miles. The deepest part of the oceans is in the Atlantic, seventy-five miles northeast of Porto Rico—4561 fathoms. Depths below 24,000 feet are about as scarce as elevations on land above 24,000 feet.
- C. Topography of the bed.
  1. Very flat; on the land, degradation is more important than aggradation; in the ocean, aggradation is more important than degradation.
  2. Some irregularities; *e. g.*, volcanic islands, coral islands, deeps or antiplateaus, cliffs which are perhaps fault scarps, *e. g.*, in the Mediterranean the water deepens 1500 feet very suddenly. The continental shelves are much more irregular; they have been from time to time above water, and have been eroded.

D. Life. "Plant life abounds in shallow water and to depths of 100 fathoms or so, and is found in abundance at the surface where the depth is much greater. Animal life abounds in shallow water, both at the bottom and above it, out to depths of 200 or 300 fathoms, and occurs in great profusion in the surface-waters of the temperate and tropical regions without regard to the depth. The great body of the ocean water lying below a depth of some few hundred fathoms is nearly tenantless, though life reappears sparingly at the bottom even where the depth is great." (C. and S., p. 313.)

E. Composition. "Every 100 parts of sea-water contain about 34.4 parts by weight of mineral matter in solution. The principal acids, solids and bases are shown in the following table (see C. and S., p. 309):

Chloride of sodium.....	77.758
Chloride of magnesium.....	10.878
Sulfate of magnesium.....	4.737
Sulfate of lime.....	3.600
Sulfate of potash.....	2.465
Bromide of magnesium.....	.217
Carbonate of calcium.....	.345

F. Movements.

100

1. Causes of—

a. Unequal densities due to—

1. Unequal temperatures.

2. Unequal pressures.

3. Unequal salinity.

b. Winds.

c. Attraction of sun and moon.

d. Earthquakes, volcanoes, landslides.

e. Differences of level of the surface; *e. g.*, higher off river mouths and lower where evaporation is great.

2. Classes of movement.

a. Waves.

b. Currents.

c. Tides.

1. Cause of.

2. Variation in the height of tides at the same place:  
(a) Seasonal—yearly; perihelion—tides greater; aphelion—tides less. (b) Conjunction of moon and sun bimonthly. (c) Daily. (d) Monthly.

d. Drift. All ill-defined slow currents. (The Gulf stream becomes a drift current in the North Atlantic.)

e. Creep. May be vertical or horizontal.

G. Temperature.

1. Horizontal variation in the Red sea from 90° to 28° F.

a. Cause of—

1. Latitude.

2. Currents.

3. Winds.

4. Distribution of land.

5. Storms.

2. Vertical variation.

H. Deposits at the bottom.

1. Deep sea—mud, ooze, etc.
2. Shallow water—muds, sands, gravel, etc.

OUTLINE OF WORK ON LAND.

A. Agents modifying land.

1. Gradational agents.
  - a.* Agents of weathering.
  - b.* Ground-water.
  - c.* Streams.
  - d.* Wind.
  - e.* Shore-lines.
  - f.* Glaciers.
  - g.* Lakes.
2. Vulcanism and diastropism.
  - a.* Volcanoes.
  - b.* Earthquakes.
  - c.* Changes of level.

B. The great topographic forms.

1. Plains and plateaus.
2. Mountains.

WEATHERING.

REFERENCES.

1. Davis, pp. 99-103; 263-275.
2. Mill, §§ 310-313.
3. Chamberlin and Salisbury, vol. I, ch. 2; also 105-109.

A. General notion of.

B. Agents of disintegration in weathering; discussion of this work.

1. Solution. Note very briefly the other sorts of work done, or aided, by water: Hydration, carbonation, oxidation.
2. Changes of temperature.
  - a.* Not involving freezing-point. How disruption is affected; where this process is important.
  - b.* Involving freezing-point. Small film of water in freezing in crack exerts pressure of 150 tons per square foot; where and when most important.
    1. In various latitudes and climates.
    2. In various seasons.
    3. At frost line on mountains.
3. Plants and animals.
  - a.* Root splitting.
    1. Lichens: Have destroyed fine polish on granite in a single night.
    2. Ants: In Massachusetts they bring one-fourth inch of fine soil to surface per year. (Shaler.)
    3. Earthworms: In England they bring ten tons per acre per year to the surface.

B. Agents of disintegration in weathering—*continued*:

4. Beating of rain.
5. Gravity.
6. Wind (discuss briefly here).

## C. Rate of weathering.

1. Character of rock undergoing change.
2. Climate.
3. Rate of removal of waste.

## D. Relation of weathering to erosion. Weathering is preparation for transportation.

## E. Results of weathering.

1. Formation of rock mantle.
  - a. Discuss transition from soil to subsoil; to rock.
  - b. Thickness of soil dependent on—
    1. Rate of formation.
    2. Rate of removal.
  - c. Some examples of thickness: 300 feet in Brazil; 50 feet to 100 feet in some of Southern states.
  - d. Does absence of soil mean that none is being formed? Kind of soil at any given place? Soils and man.

## F. Topographic results.

1. Talus piles.
2. Serrate topography of high altitudes.
3. Columns, boulders of disintegration, etc., due to differential weathering.

NOTE.—See "Laboratory Material." It will be well to introduce laboratory or library work. The teacher will find the topographic map described in Chamberlin and Salisbury's *Geologic Processes*, vol. 1, p. 28. Any of the maps referred to in "Laboratory Material" may be obtained at a very small cost by writing to the Director of the Geological Survey, Washington.

## GROUND-WATER.

## REFERENCES.

1. Davis, pp. 224-230.
2. Mill, §§ 313-317.
3. Chamberlin and Salisbury, vol. I, ch. 4.

## A. Facts about.

1. Fact of existence of ground-water. How shown?
2. Source of. Reasons for believing rainfall chief source.
3. What determines amount of rain-water which enters ground?
  - a. Porosity of soil.
  - b. Slope.
  - c. Climate.
  - d. Rate of precipitation.
4. The level of ground-water.

5. Is level of ground-water constant? How known? Factors determining position of water-table.
6. Form of water surface. Gravity alone would tend to give it what form? Does water-table ever come above surface?
7. Depth to which ground-water goes. How limited is descent?
8. Amount of ground-water.

**B. Work of ground-water.**

1. Mechanical.
2. Chemical.

a. Solution. Can all waters dissolve? Solvent power varies with—

1. Heat (gypsum most soluble at 38° C.)
2. Pressure.
3. Content.

b. Deposition. Due to—

1. Change of temperature.
2. Evaporation.
3. Change of pressure.
4. Mingling of solutions.
5. Plants.

c. Types of change brought about.

1. Subtraction; rock disintegration.
2. Substitution; petrification.
3. Addition; rock cementation; veins.
4. New combinations.

**C. Results of work of ground-water.**

1. In weathering—already discussed.
2. Caves and cave deposits.
3. Sinks.
4. Natural bridges.
5. Creep, slump, and landslides.

**D. Springs.**

1. Notion of.
2. Types of—

a. Hillside spring.

b. Fissure spring.

c. Artesian wells. Conditions of formation. Examples:  
Along the Atlantic coastal plain; in the Great Plains region.

d. Geysers.

1. What?
2. Where?
3. Phenomena of eruption.
4. Cause of eruption and steam.
5. Fate of geysers.
6. Deposits about geysers.

## STREAM WORK.

See Chamberlin and Salisbury, vol. I, ch. III.

I.—*Development of a Valley.*

(See Wisconsin Survey Bulletin No. 5, ch. III.)

- A. Take hypothetical case of newly emerged coastal plain with uniform seaward slope.
  1. Conditions for sheet erosion without valleys.
  2. Concentration of run-off. How secured. Results.
    - a. Single slight depression near and at right angles to shore.
  3. Growth of gully in three dimensions: gully-hood to ravine-hood to valley-hood.
  4. Direction of headward growth.
  5. How the valley gets a stream.
  6. Intermittent and permanent streams. Interrupted valley growth in early life; uninterrupted growth later.
  7. Tributaries.
  8. The volume of the stream; conditions determining climate gradient.
  9. Velocity of stream; conditions determining.
  10. The work the stream does.
    - a. Transportation.
    - b. Corrasion.
    - c. Deposition.

II.—*Transportation by Streams.*

See Chamberlin and Salisbury, vol. I, pp. 109-113.

- A. How the stream gets its load.
  1. Wears or dissolves it from bed or sides of channel.
  2. Receives it from—
    - a. Tributaries.
    - b. Side slopes; delivered by wash or gravity.
    - c. Wind.
- B. How the load is carried.
  1. Mechanically.
    - a. Rolled down bottom.
    - b. In suspension. How accomplished? A particle dropped again and again.
  2. In solution.
- C. Velocity and transporting power; development of law.
  1. Dependent on velocity.
  2. Velocity depends on what?
- D. Some examples of amount of material transported by streams.
  1. Mechanically. The Mississippi takes into Gulf each year enough solid sediment to cover one square mile to a depth of 268 feet.

2. In solution. "Annual discharge of Thames past Kingston (few miles above London) is estimated at 548,230 tons of dissolved mineral matter, two-thirds of which is carbonate of lime." "Rivers of England and Wales carry each year to the sea 8,370,630 tons of solid in solution." "Rhône carries past Avignon 8,290,464 tons of dissolved salts per year." (Geikie, *Phys. Geog.* 281.) "Thames takes past Kingston 1502 tons per day." (Huxley, *Phys.*, p. 126; see C. and S., *Geol.*, p. 103.)

### III. — *Corrasion of Streams.*

See Chamberlin and Salisbury, pp. 113-116.

- A. Practical inability of clear water to corrade. Case of Niagara river.
- B. The tools of the stream.
- C. Rate of corrasion. Discuss as the chief determinants, the influence of—
1. The character of the rock.
    - a. Hardness.
    - b. Structure. Consider:
      1. Stratified *versus* massive rocks.
      2. Horizontal *versus* inclined beds.
      3. Inclined beds, the stream flowing (a) with dip, (b) against dip, (c) with strike.
    - c. Chemical composition. Solubility.
  2. Velocity of stream.
  3. Load.
    - a. Amount.
    - b. Character; as shape and hardness.
  4. Stream subject to great and sudden fluctuations *versus* one of nearly constant volume.

### IV. — *Erosion Cycle; its Stages.*

See Chamberlin and Salisbury, vol. I, pp. 75-87.

- A. Land surface unaffected by streams. Its erosion history un-begun.
- B. Topographic youth.
  1. Surface affected by narrow, steep-sided valleys. Lakes and falls often present. (These to be discussed later.)
  2. Flats are at this stage the inner stream uplands.
  3. Narrowing of intervalley uplands.
    - a. Wash on valley sides.
    - b. General weathering processes on slopes.
    - c. Tributaries.
- C. Topographic maturity.
  1. Characteristics: Maximum of slope and run-off; hill and valley country. Many more streams than in youth; country completely dissected by erosion lines.

C. Topographic maturity—*continued*:

2. Consider influence upon topography at this stage of—
  - a. General altitude of region and nearness to the sea.
  - b. Rock structure; horizontal *versus* folded beds.

## D. Topographic old age.

1. Characteristics: Shallow, wide-open valleys. Low, rolling interstream areas. Sluggish, meandering rivers.

## E. Final development of—

1. Pene-plain.
2. Base-level plain. (This accomplished first near the sea.)

## F. The term “cycle of erosion.”

*Note.*—Read Davis on “Young, Mature and Old Rivers.” While young, mature and old topographies are being discussed, it will be well to introduce “Cross-sections and Profiles.” (See “Laboratory Material.”)

V.—*Special Features Resulting from Special Conditions of Erosion.*

## A. Bad-lands topography.

1. Conditions for—
  - a. Considerable altitude.
  - b. Unindurated rocks.
  - c. Generally arid climate, with marked concentration of what rain is received.
  - d. Absence of vegetation.
  - e. Horizontal strata for best development.
2. Developed in early mature stage of erosion.
3. Where formed?

## B. Canyons.

1. Notion of.
2. Conditions for—
  - a. Considerable altitude.
  - b. Dry climate.
  - c. Running water.
  - d. Such a condition of the rocks as will permit their standing in steep walls.

## C. Rapids and falls. (These and the following features result primarily from inequalities of hardness.)

1. General conditions for.
2. Discuss with diagrams, using horizontal strata, the possible change from rapid to falls to rapids. Consider possibilities with inclined strata.
3. Other ways in which falls may develop.
  - a. Over fault scarps—Colorado.
  - b. When forced to take new course—Niagara.
  - c. When streams overflow lava—dams.
  - d. Hanging valleys.

D. Narrows.

1. Determining conditions.
2. Erosion stage at which conspicuous.

E. Elevation due to differential erosion.

1. Mesas.
2. Buttes.
3. Hogbacks.
4. Monadnocks.
5. Plugs, dike ridges, etc.

F. Natural bridges.

1. Developed in connection with waterfalls.
2. Developed from caverns.

VI.—*Stream Piracy and Adjustment.*

A. Piracy.

1. What?
2. How accomplished? Captor has advantage of deeper valley, due to inequalities of volume, load, or hardness.
3. Examples. (See "Laboratory Material.")

B. Stream adjustment.

1. What it means.
  - a. Most common in region of folded strata.

VII.—*Effects of Changes of Level.*

A. Uplift.

1. Equal rise everywhere, coast in same position. Resulting terraces. Resulting longitudinal profile.
2. Entrenched meanders.
3. Lengthwise and crosswise valleys.
4. Pene-plain levels.

B. Subsidence.

1. Drowned valleys.
  - a. All parts of basin sinking equally.
  - b. Basin sinking unequally.

VIII.—*Stream Aggradation.*

A. Why a stream deposits. When overloaded due to—

1. Decrease in gradient.
2. Decrease in amount of water, due to evaporation, absorption.
3. Change in shape of channel.
4. Overloaded by tributaries.
5. Change in character of material.
6. Checking of current in flowing into body of standing water.

**B. Places of chief deposit by rivers.**

1. At base of steep slopes in its upper course. In case of great rivers, this is where they leave the mountains and enter plains.
2. On flood-plains.
3. At the debouchure.

**C. Topographic features due to stream deposition.**

1. Cones and fans.
2. Flood-plain features.
  - a. What is a flood-plain? Erosion and deposition both involved in its making; lateral planation develops a flat.
  - b. The deposit over the flood-plain; natural levee.
  - c. Meandering of stream; oxbows.
  - d. Size of some flood-plains: Mississippi, 50,000 square miles, and average thickness of alluvium, fifty feet.
3. Deltas.
  - a. How formed.
  - b. Distribution of deltas.
  - c. Why do not all streams have deltas?
  - d. Rate of growth.
    1. Determinants. Some examples: Mississippi, one inch in sixteen years; Po—Adria, once on the seashore, is now fourteen miles inland.
  - e. Size of deltas.
    1. Ganges, 50,000 square miles.
    2. Mississippi, 12,000 square miles.

**4. Terraces.**

- a. What?
- b. How formed? They result from:
  1. Uplift of basin.
  2. Removal of obstruction.
  3. Normal progress of valley development.
  4. Withdrawal of excess of load.

**WORK OF THE WIND.**

See Chamberlin and Salisbury, pp. 20-39.

**A. Transportation.**

1. How it gets its material.
  - a. Picks it up.
  - b. Extraterrestrial.
  - c. From volcanoes.
2. How kept in suspension.
  - a. Upward currents.
  - b. By friction of air.

3. Distance to which material is carried.
4. Transportation of dust important wherever—
  - a. Strong wind.
  - b. Dry surface.
  - c. Lack of vegetation.
  - d. Earthy matter.

Sage-brush plains.

B. Erosion—abrasion.

1. How?
2. Where an important agent of erosion? “In eastern Sahara wide areas of rocky land have been leveled.”
3. Topographic results.
  - a. Toadstool effects.
  - b. Etching out of soft rock.
  - c. Polishing and shaping of stones.

C. Deposition.

1. Dunes.
  - a. What?
  - b. Where? Wherever dry sand is exposed to the wind.
    1. Shores.
    2. Dry valleys.
    3. Deserts.
  - c. How formed? (See Chamberlin and Salisbury, vol. I, p. 24.)
  - d. Height of dunes, 200 to 300 feet; 10 to 20 feet commonly.
    1. Strength of wind.
    2. Supply of material.
    3. Size of grains.
  - e. Migration of dunes.
    1. How accomplished.
    2. Examples (see Chamberlin and Salisbury, p. 32): (a) Burial of orchard in New Jersey; (b) church in Germany—1800, 1839, 1869.
    3. How stopped? (Between 1826 and 1838 the government spent \$28,000 to fasten dunes on harbor shores of Provincetown, Mass., by beach grass.)
2. Loess (see Chamberlin and Salisbury, p. 22).
  - a. Description; physical character.
  - b. Where found. China: Source; thickness, 1000 feet. Europe. United States.
  - c. Origin: Wind; sediment of smaller rivers of glacial period.

## SHORE-LINES.

See Chamberlin and Salisbury, pp. 326-351.

- A. Facts of shore-lines horizontally considered.
  1. Regular.
    - a. Straight.
    - b. Curved.
  2. Irregular. Types of irregularity.
    - a. Reentrance of water.
      1. Large—Hudson bay, etc.
      2. Small—Delaware bay, etc.
    - b. Projection of land.
      1. Parallel to the general trend.
      2. Normal to the general trend.
    - c. Distribution of—
      1. By continents.
      2. In latitude.
      3. With reference to relief of land.
- B. As they are vertically considered.
  1. Low, more often regular, in vertical sense.
  2. High, more often irregular, in vertical sense.
- C. Forces at work upon shore-lines.
  1. Diastrophism.
    - a. Uplift.
    - b. Subsidence.
  2. Gradation.
    - a. Degradation.
    - b. Aggradation.
 

Both phases of work done by winds, rivers, waves and littoral currents, currents (ocean), glaciers, shore ice.
  3. Vulcanism.
    - a. Constructive.
    - b. Protective.
  4. Above forces usually work in combination of some kind.
- D. Conditions affecting the operation of forces.
  1. Strength of waves.
    - a. Determinants.
      1. Strength of wind.
      2. Depth of water.
      3. Expanse of water.
    - b. Examples: Storm waves beat on Outer Hebrides with force equal to pressure of three tons per square foot. In Shetland islands waves have torn up masses of rock  $8\frac{1}{2}$  tons in weight and heaped them together at a height of 62 feet above high-water mark. Other blocks "quarried out" at levels from 70 to 74 feet above sea.

2. Concentration of blows. Determined by angle of incidence.
3. Resistance of rock.
  - a. Hardness of.
  - b. Structure of. Consider—
    1. Horizontal beds.
    2. Beds dipping seaward.
    3. Much- *versus* little-jointed rocks.
4. Accessories :
  - a. Clear waves ineffective against hard rock; shown by barnacles being as numerous after as before great storms of Outer Hebrides.
  - b. Work done by aid of—
    1. Rock fragments.
    2. Air. In cliffs with cracks and joints, waves drive air with prodigious force; its contraction and expansion a powerful agent.
    3. Ice.

E. Shore-line features, resulting from above.

1. Initial forces resulting from diastrophism.
  - a. Uplift — gives regular, simple shore-line.
  - b. Subsidence — produces irregular, embayed coast.
2. The cliff.
  - a. Its formation. (See C. and S.)
  - b. Declivity of cliff depends on ?
  - c. The wave-cut terrace.
  - d. The wave-cut and built terrace.
  - e. Example of rate of retreat of land: Six feet in one year on Nantucket.
3. The beach of transportation. Develop idea of littoral current.
  - a. Origin of shore drift.
    1. From cliffs.
    2. From rivers.
4. Depositional forms.
  - a. Current holds its direction and shore-line during —
    1. Spit.
    2. Hook.
    3. Bar.
    4. Loop.
  - b. Barrier on shelving coast.

F. Stages in coast-line development.

G. Application of foregoing to coasts, especially of North America.

References:

1. Topographic Atlas of United States, folio 1.
  - a. Fiord coast.
  - b. A barrier-beach coast.
2. United States Geological Survey, Monograph I, ch. II.

## PRESENT GLACIERS.

## REFERENCES.

1. Chamberlin and Salisbury, ch. V, esp. pp. 238-253 and 268-286.
2. New Jersey Survey, vol. V, ch. III, esp. pp. 68-76.
3. Wisconsin Survey, bulletin V, ch. V, esp. pp. 73-105.

## A. Facts about.

1. What?
2. Under what conditions formed?
  - a. Where do these conditions obtain?
  - b. Snow-line and its position in tropics; in other latitudes—8800 feet in Switzerland.
3. Transformation of snow into ice. Névé.
4. Movement of glaciers.
  - a. Fact of.
  - b. Controlling conditions.
  - c. Differential movement.
    1. Mer de Glace, in summer 27 inches in center and 19 inches near sides.
    - d. Examples of rate: Swiss glaciers, 1 to 3 inches or 4 inches per day. Greenland, average of edge, 1 inch per week; locally, 50 to 60 feet per day.
5. Lower limit.
  - a. How determined?
  - b. Where, with reference to snow-line? In Switzerland, 3500 feet below (average). Within 670 feet of sea-level in case of one New Zealand glacier.
  - c. Oscillation of end.
    1. Causes.
    2. Examples: Alaska retreating; some Norwegian retreating, some advancing; 35- to 40-year cycle in Switzerland.
6. Surface features; irregularity.
  - a. Due to debris.
  - b. Due to unequal melting following cracking.
  - c. Change in slope.

## B. Types of glaciers.

1. Ice caps.
  - a. Greenland, 300,000 to 400,000 square miles.
  - b. Antarctic, 3,000,000 square miles.
2. Valley glaciers.
  - a. Alpine type.
  - b. High-latitude type.
3. Piedmont glaciers.
4. Cliff glaciers.

## C. Work of glaciers.

## 1. Kinds of work done.

## a. Transportation.

1. How load is obtained.

2. Transportation by ice *versus* by rivers. Moraines:  
Lateral, medial, and ground.

## b. Erosion.

1. Tools.

2. Characteristics of surfaces and rocks worn.

## c. Deposition.

Ice deposits *versus* water deposits. Moraine; terminal.

## 2. Topographic effects.

a. Shaping of hills; Roche Moutonnée.

b. V- to U-shaped valleys.

c. Hanging valleys.

d. Fiords.

e. Rock basins, at slopes of mountains, etc.

f. Depositional features. (Perhaps only terminal moraines should be mentioned here. Others to be discussed in connection with American ice-sheet.)

## PAST GLACIERS.

See Davis, pp. 330-346.

## A. General discussion of glacial period.

1. Centers of dispersal.

2. Extent of glaciated area.

3. The glacial period complex; several advances of the ice.  
Five epochs known.

4. Driftless area.

5. Cause of glacial climate.

6. Time relations. Time since last much shorter than time  
between first and last.

## B. Drift deposits.

## 1. Unstratified.

## a. Moraines.

1. Ground.

2. Terminal: Where formed? Characteristics.

## b. Drumlins.

## 2. Stratified.

a. Kames.

b. Eskers.

c. Outwash plains.

d. Valley trains.

## C. Geographic effects.

1. Reduce slopes.
  - a. Effect on transportation.
  - b. Increased arable land.
2. Modification of soil.
  - a. Amount increased.
  - b. Physically mixed.
3. Drainage.
  - a. Lakes and marshes.
    1. Lakes, how formed. Marginal lakes. The Great Lakes, due to (a) Wearing, eroding action of streams. (b) Uplifting and tilting of the land. (c) Glacier abrasion and obstruction by drift.
  - b. Floods diminished.
  - c. Water-power.
4. Change in acreage of land.
  - a. Addition. Long Island covers bare rock.
  - b. Subtraction. Lakes and marshes.

## D. Contrast between glaciated and non-glaciated areas.

1. Topography—in unglaciated, elevations stand in definite relations to drainage lines.
2. Drainage—driftless well drained; in drift area, lakes, marshes, and undrained depressions.
3. Mantle rock.
  - a. Thicker in drift.
  - b. Physically diverse.
  - c. Contact with under rock.

## LAKES.

See Chamberlin and Salisbury, pp. 368-374.

## A. Origin of basins.

1. Due to crustal movements.
  - a. Depressions are new land surfaces: Southern Florida.
  - b. In mountains: Block mountain region of Oregon.
  - c. Warped valleys.
  - d. Earthquakes: "Sunken country"; Reelfoot lake, Tenn.
2. Formed by river action.
  - a. Oxbows.
  - b. Delta lakes: Ponchartrain.
  - c. Damming by fan: Tulare; Pepin.
  - d. Rapid aggradation by main—ponding back of tributaries: Red river, Louisiana.

3. Accidents to rivers. Damming by—
  - a. Lava flows.
  - b. Drift: Finger lakes.
  - c. Landslides. Several large lakes have been formed in the upper Ganges region by great landslides damming rivers. One formed in 1892-'93 that was five miles long, 700 yards broad, and 775 feet deep. Dam broke in 1894, great damage resulting.
4. Formed by glaciers.
  - a. See 3: b, above.
  - b. Irregular deposition of draft.
  - c. Rock basins; ice erosion. Canada, Finland, and western mountains.
  - d. Marginal lakes: Agassiz, etc.
5. Due to waves and currents; back of bars.
6. Due to work of ground-water. Ponds in sinks.
7. Due to volcanic action.
  - a. See 3: a, above.
  - b. In caldrons: Crater lakes.

B. Life-history. Short-lived—

1. Filling.
2. Cutting down of outlet.
3. Work of vegetation.
4. Evaporation.

C. Salt lakes.

1. Conditions of formation.
2. Where?
3. Deposition.

D. Relation to man.

1. Great area lost to agriculture.
2. Fertility of old lake floors. (Wheat region of Red River country.)
3. Prevent destructive floods.
4. Great Lakes and development of north-central United States.

## VOLCANOES.

A. Definition of: "Restricted vent, out of which hot rock material comes."—*Salisbury*.

1. Essential points.
  - a. Vent.
  - b. Discharge of hot rock.

## B. Facts about.

1. Types of eruption.
  - a. Violent.
  - b. Quiet.
2. Degrees of activity.
  - a. Active.
  - b. Dormant.
  - c. Extinct.
3. Products.
  - a. Lava: "Mineral matter dissolved in mineral matter," not merely liquid rock. "Water with mineral matter in solution grades insensibly into lava."
  - b. Cinders (scoria).
  - c. Ashes.
  - d. Vapors and gases. ( $\text{H}_2\text{S}$ ,  $\text{H}_2\text{O}$ ,  $\text{CO}_2$ ,  $\text{SO}_2$ ,  $\text{HCl}$ ,  $\text{Cl}$ ,  $\text{S}$ . Many others in very small amounts.)
4. Relations of adjacent vents.
  - a. In activity.
  - b. In height of lava.
  - c. In kinds of material discharged: Vesuvius, Krakatoa, Mauna Loa, Stromboli.
5. General phenomena.
6. Destructiveness.
  - a. Lava flows.
  - b. Ashes, cinders.
  - c. Torrents.
  - d. Earthquakes.
  - e. Landslides.
7. Topographic results:
  - a. Cones:
    1. Cinder cones: Mauna Loa; diameter 25 times height.
    2. Lava cones: Mount Shasta; diameter 7 times height.
  - b. Plateaus.
8. Number: 300 active; very many cones not yet eroded away.
9. Distribution:
  - a. Continents *versus* islands; one-third of present volcanoes on continents.
  - b. Nearness to sea.
  - c. Latitude.
  - d. In belts or lines.
  - e. Mountains.
  - f. Moving land.
  - g. Young strata.

10. Physical character.
  - a. How stream moves.
  - b. Section from top to bottom.
  - c. Porphyry, glass, etc. Basaltic structure. Tuff.
- C. Volcanoes in past time. No known law governing distribution in time. Periods of greater and lesser energy and number.
- D. Eruptions and irruptions, not volcanoes proper.
  1. Lava fields.
  2. Laccoliths.
  3. Sills.
  4. Dikes.
- E. Cause of volcanoes.
  1. Things to account for.
    - a. Heat. Probably 3000° F. at surface.
      1. Primal; four theories.
        - (a) "Thin-crust theory." Crust has formed by cooling, to thickness of about thirty miles. Interior molten. Lava ejected by volcanoes is primordial, never-consolidated material. Theory untenable. Impossible for matter of interior to be in liquid state because of enormous pressure of overlying rocks. Astronomical behavior of the earth is like that of a rigid and not of a fluid body.
        - (b) This theory postulates: (1) A very large solid nucleus (centrosphere); earth first solidified at center from pressure. (2) Solid crust (lithosphere); crust formed at surface by cooling. (3) Subcrustal layer of fused matter (tektosphere) "upon which the crust floats in equilibrium." Tektosphere "not under sufficient pressure to be consolidated, and, being protected by the crust, has not yet cooled to the point of solidification. Transition between these layers gradual and not abrupt. "There are many geological phenomena that are best explained by such a supposition."—*Le Conte*. Murray believes in this theory. "Quite certainly not true."—*Salisbury*. Objections from standpoint of volcanoes. If true there should be intimate relations between adjacent vents.
        - (c) That the earth is solid except for "localized enclosures of molten matter" at various depths from the surface. Such lakes of liquid matter are the reservoirs from which lava comes. "Absolutely untenable. No reason for matter of these lakes to remain liquid, while all the rest consolidated."—*Salisbury*. "We are yet far too ignorant to decide between these different views, and it is merely a question of greater or less probability, according to the available evidence."—*Scott's Geology*, p. 34.
        - (d) Postulates that earth is solid throughout, but that rocks at some little distance from the surface are in a "potentially liquid state," kept solid only by the enormous pressure to which they are subjected. If, by unequal contraction of crust (in accordance with the "contractual theory"), the crust is arched up at any place, the pressure upon the underlying rocks is relieved, and they become liquid. "The heated condition of the lava is assuredly primal, and this is by far the most satisfactory of the four theories."—*Salisbury*.

E. Cause of volcanoes—*continued*:

## 1. Things to account for—

## a. Heat—

## 2. Secondary.

- (a) Chemical theory. (1) Heat is due to "oxidizing effect of descending waters upon the unoxidized interior of the globe." (2) Generated by the combustion of hydrogen gas: qualitatively all right, but quantitatively not. Sufficient heat could not be generated at any one time at any one place. (b) Mechanical: Due to "the friction produced by the folding and crushing of rocks deep within the crust of the earth, due to the shrinkage of the earth as it cools." Time element fatal. Illustrate by Appalachians. "No man who has a right to an opinion now believes that the heat is secondary."—*Salisbury*.

## b. Force.

1. Steam and other gases.
2. Gravity.
3. Lateral pressure.

## F. Life-history of volcanoes. (See "Volcanoes of North America," by Russell.)

## G. Notes on ejecta:

## 1. Types of texture in igneous rocks:

- (a) Glassy; (b) compact; (c) porphyritic;  
(d) granitoid; (e) pyroclastic.

See Scott's *Geology*, pp. 189-191.

Regarding lava as dissolved mineral matter, "differentiation of magma" is easily accounted for. Between eruptions minerals crystallize out, and, therefore, character of magma varies.

Successive sheets of lava were called "trap." Name now used for dark, basaltic lava.

Origin of "trap ridge," Mounts Tom, Holyoke, etc.

Heat of earth's interior may be slowly increasing because of increase of pressure due to the coming of meteorites to the earth.

Possibility of lava "eating its way out."

Columnar structure.

"May have true flames in connection with eruptions, due to combustion of gases."—*R. D. Salisbury*.

Brilliant inner walls of many craters; rising gases and vapors unite with rock, forming new compounds.

VESUVIUS IN HISTORIC TIMES. (See "Aspects of the Earth," by Shaler.) In 63 A. D. earthquakes began and continued at irregular intervals, culminating in eruption of 79 A. D. Eruptions occurred in 203, 472; 1036 to 1500, five eruptions; 1631, very violent, 18,000 persons perished; since 1631 about eighty eruptions, most noted that of April 26, 1872. "In most of the eruptions of Vesuvius, lava constituted not over one-fifth of mass of rock material ejected." "Small percentage of ejecta accumulates around vent. Vesuvian dust which fell within ten miles of crater formed stratum averaging more than one foot in depth."

**EARTHQUAKES.**

See Chamberlin and Salisbury, pp. 503-512.

- A. What? Tremors of appreciable violence, springing from sources within the earth itself.
- B. Where?
- C. Frequency. Japan, three or four per day. "Crust of earth is in a perpetual tremor."
- D. Phenomena of earthquakes.
  - 1. Series of elastic waves, spherical.
  - 2. Amount of actual movement. Fraction of millimeter.
  - 3. Rate of propagation of wave.
    - a. Determining conditions. Elasticity and continuity of rock.
    - b. Estimated rate. "Several hundreds to several thousands of feet per second at the surface."
  - 4. Depth affected.
    - a. How position of flows is estimated.
    - b. Most originate within 5 to 10 miles of surface.
- E. Causes of earthquakes.
  - 1. Fissuring.
  - 2. Faulting.
  - 3. Volcanic explosions.
  - 4. Avalanches.
  - 5. Falling in of caverns.
  - 6. Slipping of material on steep submarine slopes.
    - a. On continental shelves (Japan).
    - b. On delta front.
- F. Effects of earthquakes.
  - 1. Open up great cracks: India, New Zealand, Japan.
  - 2. Faults: Owen's valley, Cal., 1872; throw, 20 feet.
    - a. Permanent changes of level: Chili, 1822; rose 3 to 4 feet for long distance. Off Greece, submarine fault scarp of 1500 feet.
  - 3. Form permanent depressions in which lakes sometimes accumulate. Sunken country. (These sometimes circular: Charleston.)
  - 4. Landslides sometimes dam valleys.
  - 5. Effect on drainage. Destroy and make springs.
  - 6. If shock is in sea, sea waves.
  - 7. Great loss of life: Lisbon, 1755, 60,000; Calabria, 1783, 40,000.

## CHANGES OF LEVEL.

- A. Method by which any change in relative position of land may be detected. Comparison with sea.
- B. Change in relative altitude of land and sea may be due to—
  - 1. Change in position of land.
  - 2. Change in sea.Can it be told which has occurred?
- C. Elevation, proofs of.
  - 1. Testimony of human erections: Bridges above water in south and west Crete; temple of Serapis; marks on Swedish coast.
  - 2. Elevated beaches, sea cliffs, etc.: Parts of southern California; east and west coast of Scotland.
  - 3. Marine shells.
  - 4. Regular, simple shore-line.
- D. Depression, proof of.
  - 1. Submerged human erections: Drowned buildings in east of Crete; drowned buildings in Greenland.
  - 2. Buried forests.
  - 3. Drowned valleys: Hudson.
  - 4. Coral reefs and atolls.
- E. Evidences of movement away from seacoast.
  - 1. Tilted old beach lines: Iroquois beach, 140 feet above Lake Ontario at Lewiston; 200 to 300 feet near Watertown.
  - 2. Some terraces.
  - 3. Interrupted profiles.
  - 4. Entrenched meanders.

## The Great Types of Land Surface.

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### PLAIN AND PLATEAU.

- A. The great types of land surface.
- B. Notion of plain, plateau, and mountain.
- C. Types of plains.
  - 1. Large *versus* small.
  - 2. Flat *versus* rolling.
  - 3. High *versus* low.
  - 4. Fertile *versus* infertile.
  - 5. Moist *versus* dry.
  - 6. Treeless *versus* forested.
  - 7. Along coast *versus* away from coast.
    - a. Around lakes.
    - b. Between mountains.
    - c. Along rivers.
- D. Different kinds considered.
  - 1. Coastal plain (Atlantic coastal plain).
    - a. Origin.
    - b. Soil belts.
    - c. Fall line.
  - 2. River plains.
    - a. Due to gradation (Marysville Butte maps).
    - b. Due to lateral plantation (Elk Point, Mont., map).
  - 3. Lake plains.
    - a. Around lakes.
    - b. Old lake floors (Sierraville, Cal.; Fargo, N. Dak.)
  - 4. Waste plains.
  - 5. Glacial plains.
    - a. Recently glaciated (Madison sheet, Wisconsin).
    - b. More remotely glaciated (Marian sheet, Iowa).
  - 6. Lava plains.
- E. Life-history of plains.
- F. Plateaus.
  - 1. Points of likeness
  - 2. Points of difference

}

between plateaus and plains.

  - a. Plateau valleys *versus* plain valleys.
  - b. Cliffs characteristic of plateaus.

F. Plateaus—*continued*:

3. Stages in plateau development.
  - a. Enforce notion that there is no such thing as "old plateau."
  - b. Effect on topography of streams. Immediate; final.
  - c. Plateau remnants—mesas and buttes.
4. Man and plateaus.

## MOUNTAINS.

## A. Mountains in general.

1. Definition.
2. Division (Le Conte).
  - a. System: "Complex of more or less parallel ranges, born at different times." (North American Cordilleras.)
  - b. Range: "A single mountain individual produced by an earth throw." (Sierra, Wahsatch, Uinta, etc. Appalachian.)
  - c. Ridge: Subordinate part of range, formed—
    1. By separate folds formed at the same time. Parallel folds of Java range.
    2. By faulting.
    3. By erosion.

## B. Kinds.

1. Block (fault)—Oregon.
2. Folded—Juras.
3. Domed—Black Hills.
4. Volcanic { Massive igneous core—Pike's Peak.  
Trap ridges—Tom; Holyoke.
5. Circumdenudation.

## C. Discussion of (each of above).

1. Origin.
2. Life-history: Youth; maturity; old age.

## D. Influence of mountains on—

1. Climate.
  - a. Elevation and temperature.
  - b. Effect of winds.
    1. Mountain and valley breezes (valley breeze, day; mountain, night).
    2. Chinook.
  - c. Rainfall: Two sides of Andes; valley of California *versus* Nevada; shore of Wales *versus* valley of Thames.

2. Economic wealth.
  - a. Fissuring.
  - b. Exposure of deep deposits by erosion.
3. Trade routes — Spain.
4. National boundaries: Eastern or western Europe; Chili and Argentine controversy.
5. Refuge for weak peoples: Highlands of Scotland; Switzerland.
6. Influence on history: Alps in early Europe; mountains of Greece; mountains of Italy.
7. Habits and customs of inhabitants: Language of Wales; customs of North Carolina mountaineers.
8. Danger to inhabitants of.
  - a. Avalanches. (Forest protection of Switzerland.)
  - b. Landslides. (Valley of Ganges.)

E. Topographic maps.

1. Volcanoes.
  - a. Young: Lassen Peak sheet; Mount Taylor.
  - b. Older, various stages of demolition: Marysville; Shasta; San Francisco.
  - c. Plugs: Crazy mountains, in Little Belt and Livingston folios.
2. Igneous mountains. Massive igneous cores: Pike's Peak.
3. Trap ridges: Holyoke (folio.)
4. Folded mountains.
  - a. Stevenson, Ala. (folio.)
  - b. Kingston, Tenn. (folio.)
  - c. Harper's Ferry, Va. (folio, etc.)

*Differences in Erosion between High Altitudes and Low.*

A. Moisture.

1. Often drier—especially in lee of mountain.
2. Often wetter—especially on windward of mountain.
3. Differences in form of precipitation. (Mountain streams do their work primarily when snow melts.)
4. Differences in rate of precipitation.

B. Wind.

1. Much more effective in high altitudes.

C. Temperatures.

1. Greater range in higher altitudes.
2. Much lower average in high altitudes.

D. Differences in vegetation.

1. Protecting or failing to protect against erosion,

## Laboratory Material for Physical Geography.

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The following list is intended to familiarize the student with the appearance of a wide variety of features on the topographic map; each map should be accompanied by a written description:

1. Montrose, Md.-Va.
2. Batesville, Ark.
3. Frostburg, Va.-W. Va.-Pa.
4. Tipton, Iowa.
5. Cottonwood Falls, Kan.
6. Minneapolis, Minn.
7. Mesa de Maya, Colo.
8. Grand Canyon map.
9. Hamilton, Mont.-Idaho.
10. Everett, Pa.
11. Iola, Kan.
12. Shasta, Cal.
13. Dennisville, N. J.
14. Tamalpais, Cal.

### WEATHERING.

Boulders of decomposition: *Journal of Geology*, vol. I, p. 762.  
 Differential weathering: *Geikie's Geology*, pp. 348, 349, 350, 355.  
 Rock disruption by tree roots: *Dana, Manual of Geology*, p. 157.  
 Gradual passage of rock to soil: *United States Geological Survey*, twelfth annual report, p. 333.  
 Talus: *U. S. G. S.*, 12th ann., part I, pp. 232, 234, 240, 242, 246, 248.  
 Elements of *Geology*: *Le Conte* (5th ed.), p. 289.  
 Serrate peaks: *U. S. G. S.*, 21st ann., part IV, p. 500, pls. 51 and 52.  
 Rock disruption by frost: *Id.*, 9th ann., p. 556.

### GROUND-WATER.

- I. Topographic sheets.
- Knoxville, Tenn.
  - Kingston, Tenn.
  - Bristol, Va.-Tenn.
  - Dodge, Kan.

1. What topographic indications of ground-water work do you find on the above sheets?
2. On the Kingston, Tenn., sheet, study particularly the Grassy Cove region, in the west-central and northwest rectangles.

II. Photographs and cuts. From library books:

1. Sink-holes and caverns: U. S. G. S., 12th ann., part I, p. 226; id., 21st ann., part IV, pp. 516, 710. Shaler, *Aspects of the Earth*, pp. 104, 122. U. S. G. S., folio Nueces, Tex., figs. 1, 2, 3, 4. Topographic Atlas, folio 3, fig. 30. Gilbert and Brigham, *Phys. Geog.*, p. 98.
2. Springs and spring deposits: U. S. G. S., 9th ann., pls. 78, 79, 80, 82.
3. Artesian wells: U. S. G. S., 17th ann., part II, p. 628, pl. LXXVIII; id., 17th ann., part II, p. 642, pl. LXXXV.

STREAM WORK.

*Erosion.*

I. Topographic sheets.

1. Highwood, Ill.
2. Danville, Ill.
3. Montrose, Md.
4. Fargo, N. Dak.
5. Abajo, Utah.
6. Yosemite, Cal.
7. Yellowstone National Park.
8. Butte, Mont.
9. Iola, Kan.
10. Parsons, Kan.
11. Abilene, Kan.
12. Charleston, W. Va.
13. Medicine Lodge, Kan.

II. Which of these show youth? Which maturity? Which old age? Give reasons for your answer.

III. Photographs, cuts, etc.

1. Pictures in library books.

- a. Young valleys: Md. Surv., Alleghany county, p. 52; id., Cecil county, p. 73; id., Garrett county, p. 84. U. S. G. S., 12th ann., part I, p. 244; id., 2d ann., pp. 62, 80. C. & S., vol. I, pp. 80, 81, 82, 92, 93.
- b. Mature valleys: U. S. G. S., 12th ann., p. 292. Md. Surv., Garrett county, p. 280, fig. 1. U. S. G. S., 12th ann., pp. 292, 296. (Late maturity.) C. & S., vol. I, pp. 83, 84.
- c. Old valleys: Russell, *Rivers of North America*, p. 108, fig. A. Md. Surv., Garrett county, p. 48. C. & S., vol. I, p. 85.

IV. Profiles and cross-sections. Use coordinate paper, and make all diagrams carefully, to scale.

1. Montrose, Md., sheet.

*a.* Make profile of the stream bed of the first valley east of the letter *C* in the word Cliffs of the name Nomini Cliffs.

*b.* Make cross-sections of this same valley directly east of the letter *C*.

2. Highwood, Ill., sheet.

*a.* Longitudinal profile of the ravine due west of the letter *L* in the name of Lake Michigan.

*b.* Cross-section of this same ravine where it is crossed by the north-south roadway, in the second road from the lake.

3. Danville, Ill.-Ind., sheet. Make cross-section of the Vermilion River valley at a point directly northeast of the letter *A* in the word Danville (name of county, not the city).

4. Fargo, N. Dak., sheet. Make a cross-section of the Red River valley along the line  $46^{\circ} 50'$ .

5. Abajo, Utah, sheet. Make a cross-section of the valley of Cottonwood Wash along the line of  $37^{\circ} 30'$ .

6. Yosemite, Cal., sheet. Make a cross-section of Yosemite valley from Sentinel Dome to the letter *O* in the name Yosemite Falls.

7. Yellowstone National Park sheet. Cross-section of the grand canyon of the Yellowstone. Make the section from the letter *V* in the name Yellowstone river to the second *N* in the word canyon.

8. Butler, Mo., sheet. Make section from Carbon Center, in the southwestern part of the map, northeast to Pleasant Gap.

9. Iola, Kan., sheet. Section from Veitsburg, south-central part of map, southwest to the margin of the map.

10. Parsons, Kan., sheet. Section from Liberty, southeastern part of map, due northwest to Walker's Mound.

11. Abilene, Kan., sheet. Section on meridian  $97^{\circ} 20'$ , from top of map south to the letter *D* in the word Dickinson.

### *Unequal Hardness.*

I. Study the following maps with special reference to the effects of inequalities of hardness on erosion topography:

Harrisburg, Pa.

Passaic, N. J.

Holyoke, Mass.-Conn.

Mesa de Maya, Cal.

Uvalde, Tex.

Cucamonga, Cal.

II. At what stage in the development of an erosion cycle are hard-rock outcrops most conspicuous topographically?

- III. On each map find topographic features which may be referred primarily to inequalities of hardness.
- IV. From topographic evidence, name the regions represented in the above list which you consider to consist of (1) massive rocks, (2) horizontally stratified rocks, (3) tilted rocks. Give reasons in each case.
- V. Draw a cross-section of the Susquehanna valley at the first narrows above Harrisburg (Harrisburg sheet, Pa.), and another two miles below the narrows. (Horizontal scale, same as map; vertical scale,  $\frac{1}{8}$  in. = 50 ft.)
- VI. What various hypotheses may be raised to account for such prominences as appear in the central and east-central rectangles of the Uvalde triangle, Texas?

*Piracy and Adjustment, etc.*

I. Topographic maps.

1. Harper's Ferry, Va.-W. Va.-Md.
2. Chattanooga, Tenn.
3. Ringgold, Tenn.-Ga.

II. Narrows; water gaps.

1. Narrows of Wills Mountain, Md. Surv., Alleghany county, pl. I.
2. Narrows of Wills Creek, id., pl. VI.
3. Potomac Water Gap, Russell's Rivers of North America, p. 268.

III. Monadnock pictures.

1. Stone Mountain, Ga., Jour. of Geol., vol. X, p. 186.
2. Physiography of the United States, p. 282.

*Stream Deposition or Aggradation.*

I. Topographic sheets.

1. Cucamonga, Cal.
2. Savanna, Ill.
3. Marshall, Mo.
4. Morrillton, Ark.
5. Hartford, Conn.
6. Tooele, Utah.
7. Donaldsville, La.
8. Tacoma, Wash.
9. Coast Survey chart No. 19.
10. Mississippi River Commission maps Nos. 13, 14, 19, 22.

II. Photographs, cuts, etc.

From library books: Rivers of North America, Russell, p. 268, fig. A (aggraded valley); id., p. 154 (terraces).  
U. S. G. S., 13th ann., part II, p. 56 (delta—good).

## III. Alluvial fans.

1. Cucamonga, Cal. Study the alluvial fans of this sheet.
2. Note and explain the behavior of the streams on and beyond the alluvial fans.
3. How far, as shown on the map, do the fans extend from the base of the mountains?
4. What distribution of material would be found in the alluvial fans?
5. How do alluvial fans differ from ancient deltas?

## IV. Terraces. Locate terraces on the following sheets:

Hartford, Conn.

La Sal, Utah.

## V. Flood-plains.

1. Donaldsville La. Note the alluvial deposits northeast of Nita crevasse.
2. Draw cross-section to scale along parallel  $30^{\circ} 5'$  on the Donaldsville sheet, La. (Horizontal scale same as map; vertical scale,  $\frac{1}{8}$  in. = 10 ft.)
3. Interpret the above cross-section.
4. Marshall, Mo. How are the lakes in the flood-plain of the Missouri river to be accounted for?

## WIND WORK.

## I. Maps.

Barnegat, N. J.

Atlantic City, N. J.

Norfolk, Va.

St. Paul, Neb.

Springfield, Colo.

Kingman, Kan.

Kinsley, Kan.

Pratt, Kan.

1. Locate the dunes and study their chief topographic features.
2. What is the average height of the dunes above their surroundings in the various regions?
3. Can any general statement be made regarding the distribution of dunes in the Kansas region, as far as shown in the maps?
4. What is the immediate source of the sand which forms the dunes in the various regions?
5. Read what is said on sand-dunes in the descriptive part of the Norfolk folio, p. 1.

## II. Photographs and cuts.

### 1. Wind erosion.

Pictures in books: Walther's *Die Denudation in der Wüste*, pp. 420, 421, 423, 424. Geikie's *Earth Sculpture*, pp. 254, 255. *Geog. Jour.*, vol. XV, pp. 17, 21. Merrill's *Rocks, Rock Weathering, and Soils*, figs. 2 and 3, opp. p. 285. *U. S. G. S.*, 21st ann., part IV, p. 520.

### 2. Dunes.

Pictures in library books: *Nat. Geog. Mag.*, Jan., 1904, pp. 43 (view on Norfolk, Va., sheet, above), 44, 45. *Agr. Year-book*, 1898, pp. 406, 407. *U. S. Dept. of Agr., Field Operations, Div. of Soils*, 1899, p. 63. *Geog. Jour.*, vol. XV, opp. p. 22. Gilbert and Brigham's *Physical Geography*, pp. 114, 115.

### 3. Effect of wind on tree shapes.

*Jour. of Geog.*, Jan., 1904, pp. 1-20 (a number of very good pictures).

## COAST FEATURES.

### I. The following maps illustrate shore features:

Atlantic City, N. J.

Freeport, Me.

Tamalpais, Cal.

Martha's Vineyard, Mass.

1. Look out for illustrations of cliffs, terraces, beaches, spits, barriers, bars, hooks, lagoons, tidal marshes, estuaries, islands, land-tied islands, deltas, coral reefs.
2. Which of the features mentioned in question 1 are shown on the Freeport sheet and the Tamalpais sheet? Give the location of each feature.
3. Atlantic City, N. J. From the present features, interpret the past history and probable future of the coast.
4. Explain the lakes near the coast on Martha's Vineyard.

## II. Photographs, cuts, etc.

From library books:

*U. S. G. S.*, 8th ann., part II, pp. 1010, 1012, 1013, 1014, 1017, 1020, 1021; id., 7th ann., pp. 330, 333; id., 12th ann., p. 227. *Wis. Surv.*, bull. VIII, pp. 28, 35, 44, 49, 100, 128, 144, 145, 147, 157.

## PRESENT GLACIERS.

### I. Topographic sheets.

1. Mount Shasta, Cal.
2. Glacier Peak, Wash.
3. Cloud Peak, Wyo.
4. Colfax, Cal.
5. Crandall, Wyo.

## II. Photographs, cuts, etc.

From library books:

- a. Snow fields and névé. U. S. G. S., 18th ann., part II, pls. 69, 73.
- b. Alpine type. Shaler and Davis, *Illustrations of the Earth's Surface*, pls. L-16. U. S. G. S., 5th ann., pp. 309-355; id., 20th ann., part II, pp. 189-193.
- c. High-latitude types. *Jour. of Geol.*, vol. IV, pp. 582-591, 769-810; id., vol. V, pp. 230-240.
- d. Alaska glaciers. U. S. G. S., 13th ann., part II, pp. 1-91; id., 16th ann., part I, pp. 421-459.
- e. Cliff glaciers. *Jour. of Geol.*, vol. III, pp. 888, 889; id., vol. IV, pp. 801, 803. C. & S., vol. —, p. 243.

*Work of Glaciers.*

## I. Topographic sheets.

1. Dardanelles, Cal.
2. Briggsville, Wis.
3. Baraboo, Wis.
4. Whitewater, Wis.
5. Minneapolis, Minn.
6. Sun Prairie, Wis.
7. Brooklyn, N. Y.
8. Canada Lake, N. Y.
9. Monadnock, N. H.
10. Pingree, N. Dak.
11. West Cincinnati, Ohio-Ky.
12. Glacier Peak, Wash.

## II. Photographs, cuts, etc.

From library books:

- a. Terminal moraines. U. S. G. S., mono. XXXIV, p. 272. Tarr, *Physical Geography of New York State*, pp. 120, 140. Le Conte, *Elements of Geology* (5th ed.), p. 58.
- b. Kames. U. S. G. S., mono. XXXIV, p. 263. Wis. Surv., bull. VIII, pl. V, fig. 2. Le Conte, *Elements of Geology* (5th ed.), p. 72.
- c. Drumlins. *Physiography of the United States*, p. 168. Le Conte, *Elements of Geology* (5th ed.), p. 71.
- d. Eskers. Le Conte, *Elements of Geology* (5th ed.), p. 72. U. S. G. S., mono. XXIX, p. 579.
- e. Glaciated surfaces. Dodge, *Reader in Physical Geography*, p. 130. U. S. G. S., 7th ann., pp. 166, 167, 175, 180, 220; id., 12th ann., pp. 228, 230; id., folio *La Plata, Colo.*, fig. 8; id., folio *Big Trees, Cal.*, fig. 1. Can. Surv., vol. XI, 1898, part G, pl. III.

### III. Special localities.

Briggsville, Wis. Characteristic glacial topography. Is the valley of the Wisconsin probably preglacial? Is it preglacial in some places and postglacial in other places?

Sun Prairie, Wis. Typical drumlin region. What direction was the ice moving when these drumlins were made? Note the poor drainage.

Whitewater, Wis. Note the terminal moraine in the southern part of the sheet. It extends northeast by southwest. Study the topography of this moraine. How would it appear in the field? North of the terminal moraine is ground moraine. Note the large marshes, lakes, and unfilled depressions, all of which are characteristic of a glaciated country. Is there an outwash plain south of the terminal moraine?

Brooklyn, N. Y. Locate the terminal moraine. Locate the outwash plain.

Glacier Peak, Wash. Note the length and the width of the glaciers about Mount Shasta.

### LAKES.

#### I. Topographic maps.

Granada, Kan.

Laramie, Wyo.

Williston, Fla.

### VOLCANOES.

#### I. Topographic sheets.

1. Shasta, Cal.

2. Crater Lake, Ore.

3. Marysville, Cal.

4. Mount Taylor, N. M.

5. San Francisco, Ariz.

6. Abajo, Utah.

#### II. Photographs, cuts, etc.

From library books: U. S. G. S., 12th ann., part I, pp. 256, 262, 264. Le Conte, *Elements of Geology* (5th ed.), p. 89. Russell, *Volcanoes of North America*, pp. 82, 142, 236, 238, 244, 270, 280; id., p. 194, fig. A (San Francisco Mountain, map above); id., p. 194, fig. B (Mount Taylor neck, map above); id., p. 224 (Mount Shasta, map above). Bonney, *Volcanoes*, p. 118. Heilprin, *Mont Pelee*, frontispiece, pp. 40, 150, 160, 266, 274, 304, 312, 313, 318, 319, 326. *Nat. Geog. Mag.*, Dec., 1903. U. S. G. S., *Professional Paper No. 3* (many views of Crater Lake, map above). *Cal. Geol.*, folio Lassen Peak (several good views in back of folio).

#### III. Specimens. For study and identification. Should include: Bomb; pumice; basalt, more or less compact; basalt, vesicular; obsidian; ropy lava.

*Mountains—Various Types.*

## I. Topographic maps.

1. Aladdin, Wyo.—S. Dak.—Mont.; horizontal strata.
2. Hummelstown, Pa.; folded strata.
3. Kaaterskill, N. Y.; dissected-plateau type.
4. Holyoke, Mass.; trap ridge.
5. La Sal, Utah; volcanic mountains.
6. Grand Teton, Wyo.
7. Honey Lake, Cal.; faulted type. (See Mono. XI, p. 25.)
8. Ishawooa, Wyo.; dissected-lava-plateau type.
9. Henry mountain, Utah; laccoliths.
10. Whitefield, N. H.—Vt.; ice-covered and shaped mountains.
11. Denver, Colo.; hogback type, pictures in physiographic folio.

## II. Photographs, cuts, etc.

From library books: Le Conte, *Elements of Geology* (5th ed.), p. 262 (good of mountain folds); id., p. 280 (hogback).  
U. S. G. S., folio La Plata, Colo. (fine views in back of folio).

*Plains—Various Types.*

## I. Topographic sheets.

1. Glassboro, N. J.; Atlantic costal.
2. Drum Point, Md.; Atlantic coastal.
3. Fargo, N. Dak.; lake-bottom plain.
4. Toledo, Ohio; lake plain.
5. St. Louis, East, Mo.—Ill.; river flood-plain.
6. Butler, Mo.; old-age plain of degradation.
7. Anaheim, Cal.; waste plain.
8. Marion, Iowa; glacial plain, old drift.

*Plateaus, Buttes, Mesas, etc.*

## I. Topographic sheets.

1. Elmore, Colo.; picture of Raton mesa, in Elmore folio, fig. 2.
2. Bernal, N. M.
3. Corazon, N. M.
4. Diamond creek, Ariz.
5. Mount Trumbull, Ariz.
6. Tusayan, Ariz.
7. Uvalde, Tex.
8. Mesa de Maya, Colo.

## II. Photographs, cuts, etc.

From library books:

Kan. Surv., vol. III, pl. II. U. S. G. S., 21st ann., part IV, pl. LXXII; id., folio Elmore, Colo., figs. 2, 3, 4 (fine); id., folio Scott's Bluff, Neb., figs. 18, 19; id., folio Camp Clarke, Neb., fig. 17. Topographic Atlas, folio 3, figs. 22, 24, 26, 27, 32, 33, 35.

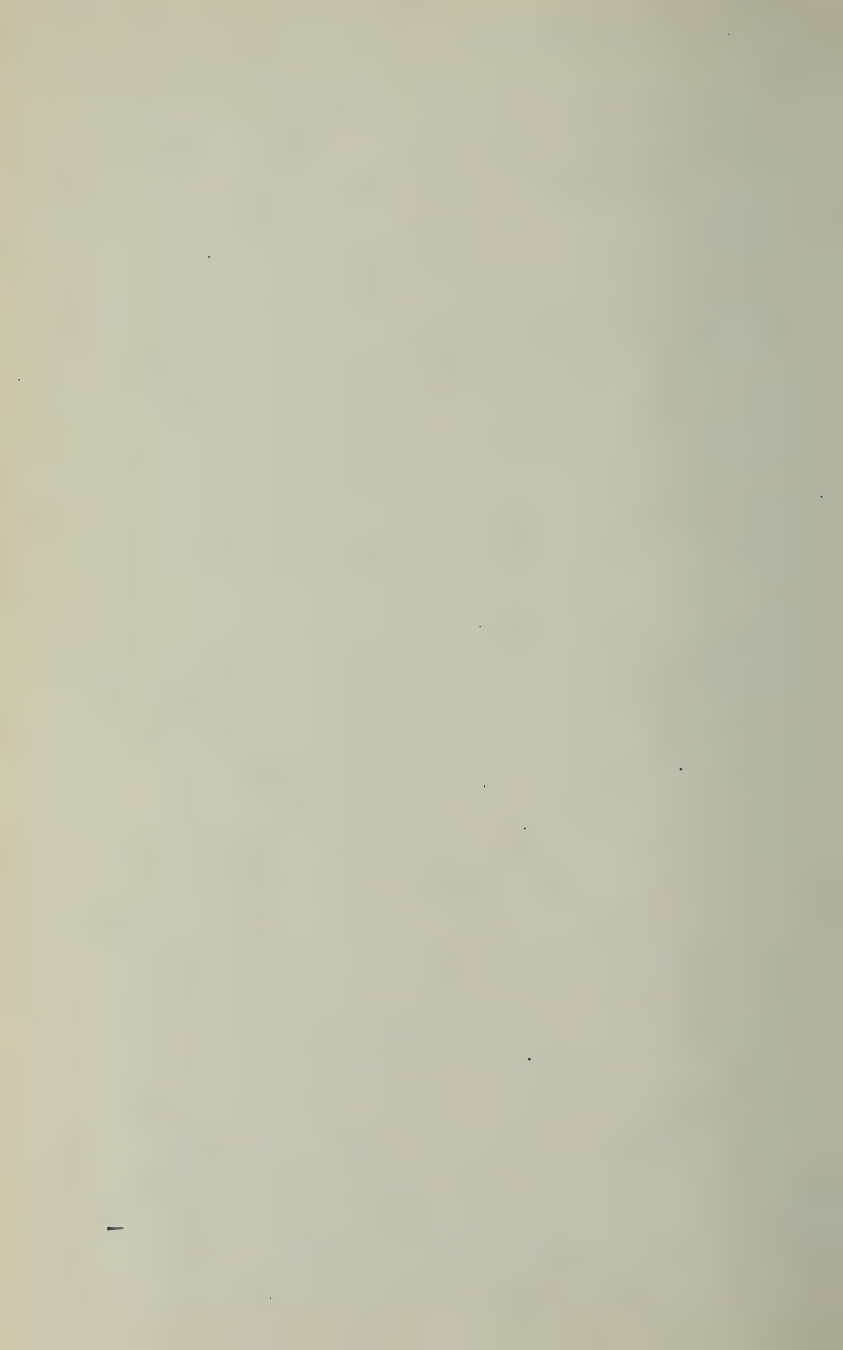
*Review Set of Maps on the Land.*

1. Green Run, Md.-Va.
2. Fort Defiance, Ariz.
3. Scottsboro, Ala.
4. Abilene, Tex.
5. Hahnville, La.
6. Block Island, R. I.
7. Glacier Peak, Wash.
8. Aladdin, Wyo.-S. Dak.-Mont.
9. Frostburg, Md.
10. Stoughton, Wis.
11. Marseilles, Ill.
12. Mount Lyell, Cal.
13. Pomona, Cal.
14. Orland, Me.
15. Lake Michigan coast chart No. 5.

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NOTE.

This outline of physical geography has been prepared at the request of many teachers and is intended primarily for the use in the high schools of Kansas. No claim is made for originality; it has been compiled chiefly from class notes taken under instructors in the University of Chicago.



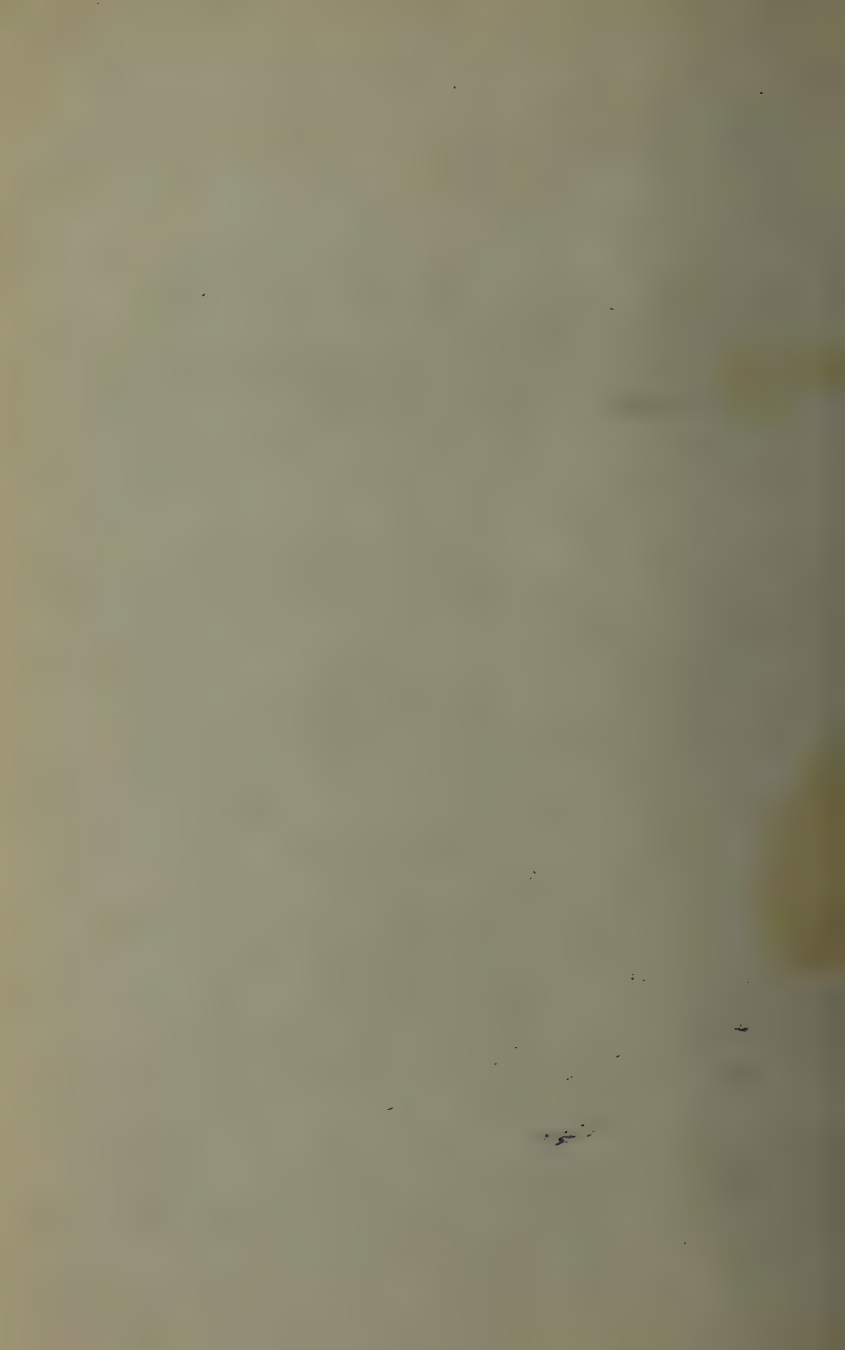












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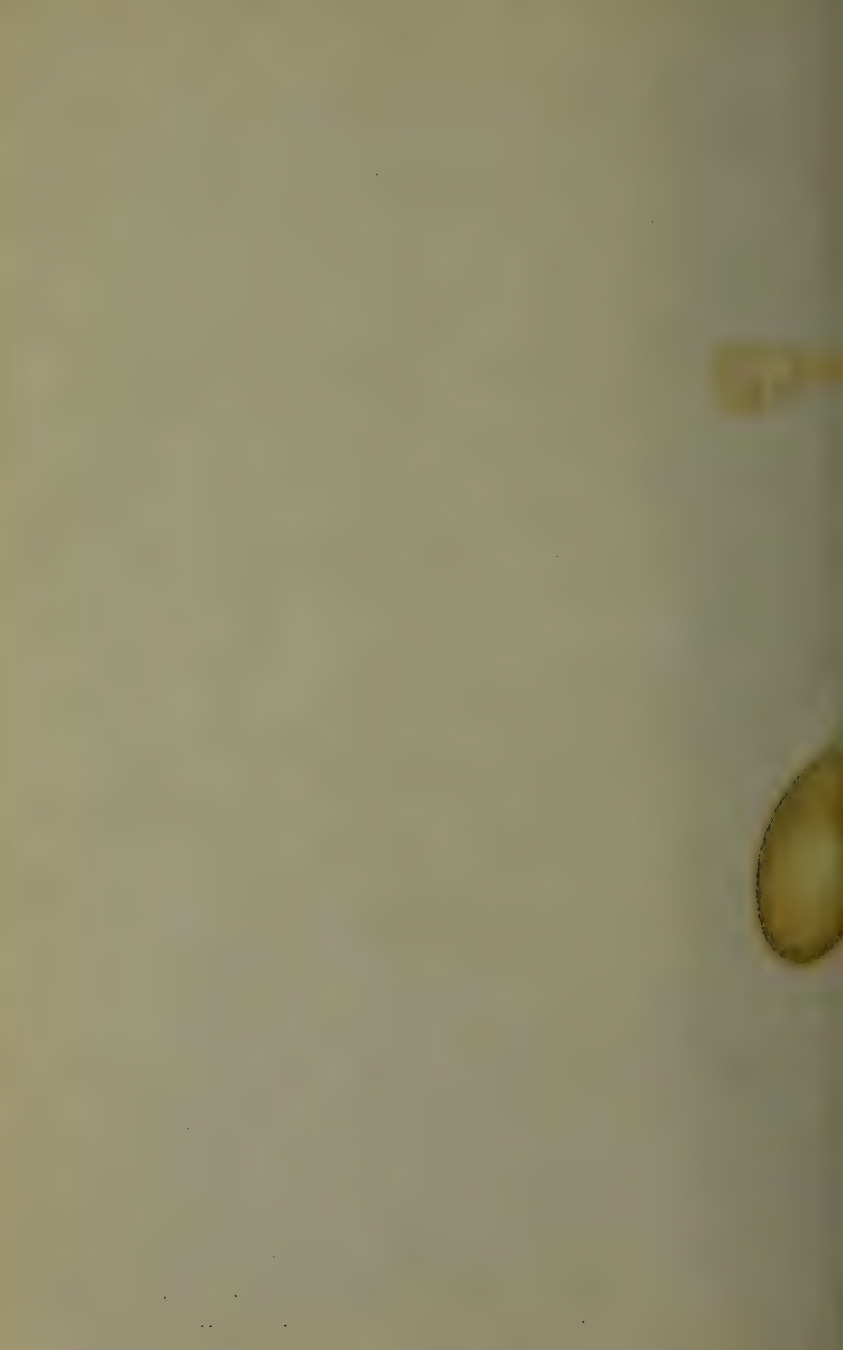
**High-School Manual,  
No. IV.**



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**High-School Manual,  
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# **The High-School Manual.**

## **No. IV.**

**T**HE purpose of this Manual can best be understood by carefully reading its contents. In a general sense it offers a definition of a unit for credit in the various subjects which are usually taught in the high school. In other words, it suggests a standard for high-school work. In addition to this, it contains many suggestions in regard to laboratory work and methods, libraries, lists of experiments, and apparatus. These suggestions have been formulated, after a careful examination of almost every high school in the state, with the advice of the best high-school instructors, and after a thorough study of the conditions, needs, and possibilities of our secondary-school system. This Manual represents, in part, the interest the University is taking in public education, and is one means by which it hopes to be of real service.

A copy of this Manual will be sent free to all superintendents, principals, high-school instructors, and members of boards of education. All inquiries should be directed to the **HIGH-SCHOOL VISITOR.**

## **High-School Visitation.**

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**T**HE duties of the High-School Visitor may be enumerated as follows: To visit the high schools as often as practicable, for the purpose of consulting with principals and instructors about their work and making such observations upon the equipment, character and amount of instruction given as time and opportunity will permit; to furnish principals and superintendents with suggestive courses of study which will satisfy college-entrance requirements, and also to furnish in detail the amount of work that should be covered in each unit of time; to assist school authorities in every possible way to increase the efficiency of their schools and make of them consistent educational instruments in the life of the state.

The attitude of all concerned in this work in any capacity is one of helpfulness and cooperation. We believe that it is the duty of the University to meet the requirements of the high schools, not by lowering its standard, but by broadening the field of preparatory requirements, thus giving the high schools an opportunity to better serve the needs of the community for which they really exist. The high school has a definite function to perform in this system of public education, and by doing this intelligently and conscientiously is best serving the interests of the University. What the University needs, what the state is expecting, of its high-school graduates, is a four-years course of consistent, thorough training, which will enable them to undertake the more difficult tasks of college work, or the more serious responsibilities of active life. To this end the University, through its High-School Visitor, goes out to the 200 high schools in Kansas in the belief that it can render valuable service in the way of advice, suggestion, and cooperation.

## **Accredited Schools.**

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High schools which maintain a high standard of proficiency and which have adopted a course of study covering four years of work are recognized by the University of Kansas by placing them on an accredited list. This list is revised every year and published in the annual catalogue. The graduates of schools thus affiliated with the University, when recommended by the principal or superintendent, are entitled to entrance credit without examination, provided the subjects for which they ask credit are distributed according to the required groups.

An accredited school should measure up to the following requirements:

1. The instructors should be well qualified and specially trained, both with reference to subject-matter and methods, for a special line of work. They should be graduates of a university, college, or high-grade normal school.

2. Instructors should not be required to carry more than six recitations per day, and these should be confined to two lines of work, as for example, English and history.

3. In the larger high schools (those enrolling 300 or more), the principal should have at least one-half of his time for supervision. In the smaller schools, he should have at least one period a day for the same purpose.

4. The laboratories should be furnished with tables for individual work and such apparatus as is necessary to enable the students to perform all experiments.

5. A laboratory period should be twice the length of a recitation period, and in each of the sciences there should be two laboratory periods per week.

6. Students should have access to standard books of reference and supplementary works in literature, history, science, and art.

7. The efficiency of instruction, intellectual and moral conditions, and general organization of the school, as evidenced by careful, sympathetic inspection, shall be considered important factors in ranking a school.

All schools which measure up to this standard in every particular are fully accredited, and graduates from the same, having completed fifteen units of prescribed work and being recommended by principals or superintendents, are given entrance credit to the

Freshman class of the University. Under existing conditions it is not possible for all schools to reach this high standard, hence those that fall short are placed in a second list and allowed a conditional credit, depending upon the amount and character of the work offered. Schools in this class are advanced to the first list when all conditions have been removed. Many high schools are working towards accredited relations with the University, but cannot offer more than two years of work at the present time. It has been customary to make a list including such schools and give whatever assistance is possible to make the work standard as far as it goes. Such high schools are encouraged to affiliate with larger schools of the county until such time as they may be able to carry a three- or four-years course.

## **Standards.**

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The University, in determining its entrance requirements, has followed, as far as practicable, the recommendations of the North Central Association of Colleges and Secondary Schools. The conditions in many of the Kansas high schools make it impossible to reach this standard at once, hence in two or three points these requirements have been modified in order to suit present conditions. At the present time ten high schools have fully reached the North Central standard, and are enrolled as members of that association. Others, no doubt, are worthy, and it is hoped that Kansas will gradually enlarge its representation upon this larger list of accredited schools.

The following constitute the standards of admission to the accredited list of the North Central Association of Colleges and Secondary Schools for the present year:

1. No school shall be accredited which does not require fifteen units, as defined by the Association, for graduation.

2. The minimum scholastic attainment of all high-school teachers shall be equivalent to graduation from a college belonging to the North Central Association of Colleges and Secondary Schools, including special training in the subjects they teach, although such requirements shall not be construed as retroactive.

3. The number of daily periods of classroom instruction given by any one teacher should not exceed five, each to extend over at least forty minutes in the clear. (While the Association advises five periods, the board of inspectors has rejected absolutely all schools having more than six recitation periods per day per teacher.)

4. The laboratory and library facilities shall be adequate to the need of instruction in the subjects taught as outlined by the Association.

5. The efficiency of instruction, the acquired habits of thought and study, the general intellectual and moral tone of a school are paramount factors, and therefore only schools which rank well in these particulars, as evidenced by rigid, thorough-going, sympathetic inspection shall be considered eligible for the list.

6. Wherever there is reasonable doubt concerning the efficiency of a school, the Association will accept that doubt as ground sufficient to justify rejection.

7. The Association has omitted for the present the consideration

of all schools whose teaching force consists of fewer than four teachers exclusive of the superintendent.

8. No school shall be considered unless the regular annual blank furnished for the purpose shall have been filled out and placed on file with the inspector. All hearsay evidence, no matter from what source, is rejected.

9. All schools whose records show an abnormal number of pupils per teacher, as based on average number belonging, even though they may technically meet all other requirements, are rejected. The Association recognizes thirty as a maximum.

10. The time for which schools are accredited shall be limited to one year, dating from the time of the adoption of the list by the Association.

11. The organ of communication between the accredited schools and the secretary of the commission for the purpose of distributing, collecting and filing the annual reports of such schools and for such other purposes as the Association may direct, is as follows: (a) In states having such an official, the inspector of schools appointed by the State University. (b) In other states, the inspector of schools appointed by state authority, or, if there be no such official, such person or persons as the secretary of the commission may select.

## **The Barnes Law.**

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The Barnes law was enacted by the legislature in 1905 and amended at the session of 1907. It provides for a county tax for the aid of high schools. The law also states that a high school in order to participate in any fund which may arise under its provisions, shall have maintained a course of study which shall enable its graduates to enter the Freshman class of the College of Liberal Arts and Sciences of the University of Kansas. The authorities at the University determined that the minimum requirements for entrance to the University fulfil the spirit of the law, and therefore made the following conditions for participation in its funds. First, the school shall maintain a course of study which contains at least twelve units of prescribed work for entrance to the University; second, at least two teachers shall be employed to do this work, who shall devote full time to the high school; third, that the work offered for University credit shall fulfil the conditions laid down in the catalogue or High-School Manual. After a school has maintained this standard for one year, it would be eligible to participate in any funds arising under the provisions of the Barnes law.

The law further provides, that when a school has organized under the provisions of the Barnes law, it shall maintain two courses of study, one of which shall fully prepare its graduates for entrance to the Freshman class of the College of Liberal Arts and Sciences of the University. Such a school, in order to fulfil the conditions of the law, would be obliged to offer at least fifteen units of prescribed work and carry the same in accordance with the conditions laid down in the catalogue or High-School Manual.

Forty-three counties have already passed favorably upon this law, and where conditions permit will during the coming year furnish aid to the high schools of the county. The influence of this law will be far-reaching. It practically brings the advantages of a secondary education to every home in the county; it also brings relief to the small struggling high schools, enabling them to provide a more efficient corps of teachers and better equipment.

At this writing, September 20, seventy-nine high schools are operating under the provisions of this law, and forty-eight schools have arranged their courses so as to participate in the funds next year.

## **Course of Study for High Schools.**

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A suggestive course of study should present a tabular arrangement of all subjects usually taught in the high school. As far as possible it should show the order in which the different branches should appear, and also the time which should be allotted to each subject in the general program. Since conditions differ so widely in the high schools of the state, it is impossible to prepare a course of study which will meet the requirements of all. It is possible, however, by means of a suggestive course, to indicate the scope, and to a certain extent the period of time during which each subject should be pursued.

The suggestive course of study which follows is intended to fulfil these conditions. It contains all of the subjects usually offered in a high school, whether accepted for college entrance or whether intended for the student who elects only such work as will best fit him for the immediate necessities of active life. It will be noticed that English and mathematics are specifically required in the first three years. Other subjects sufficient in number to complete the course should be selected from the various groups by the principal or superintendent. In preparing a program of studies for any school, the principal should take into consideration, first, the qualifications of the teaching force; second, the equipment of the school; third, the conditions and ideals which have prevailed in the school in previous years; fourth, college-entrance requirements. Care should also be taken not to increase the number of optional subjects so as to overwork the teachers, or so that any instructor will be required to teach a branch for which he is not thoroughly prepared. Keeping these suggestions in mind, it will not be difficult for any principal to make out a course of study which will not only meet the conditions in the school, but also the requirements for college entrance, or entrance to any of the special schools in the state.

The course of study, when properly adjusted to the needs of a school, should not be changed except for good reasons. Students are often discouraged, sometimes prevented from graduation, or compelled to take subjects which are entirely out of their course, because the new superintendent insists upon introducing a new schedule of work, when the old one was perhaps just as good. A school can never reach a high degree of efficiency, or build up an

individual life of its own, while its policy and its program of studies are annually subjected to a useless readjustment.

The high schools in this country which have earned a reputation for strength and solid worth are those which have maintained the same conservative policy for a term of years, making only such changes from time to time as are consistent with the progress of educational theory and practice.

In making a course of study for a high school, the so-called regular subjects should be given first place. These are three units each of English, foreign language, mathematics, science, and history. These subjects should be found in every high-school course of study, and if given in the same ratio as indicated here, they will compose all the units of work in a four-years course except one. Other subjects may be added as rapidly as the facilities will permit, but should not be substituted for any of the standard units. These units should always be open to all students who prefer them. This means that in the small schools the students will not have a wide range of subjects from which to choose, but as numbers increase and necessary facilities for giving instruction are added they may enjoy greater freedom in selecting their work.

No subject should be given a place on the program unless it can be handled in the proper way. Bookkeeping is a practical subject and affords an excellent discipline if presented in proper form, but this would require a suitable room with special desks and other facilities, all of which are very expensive; and the result is that this subject, as often taught, is simply waste. Manual training, agriculture, drawing, etc., all of which require special facilities and specially-trained teachers, should be added only when the school is in a financial condition to carry them on properly.

Finally, the principal of a high school should carefully explain to his students, as they enter the Freshman class, the significance of the program of studies. He should make a clear distinction between those subjects usually designated as cultural studies and vocational studies, and impress upon their minds that a mistake in choosing a line of work thus early in their course might cause much loss of time later on. The average student who enters the high school has little idea of the direction his powers may take. He is often indifferent as to the real purpose of his being there, and if permitted to choose his own course without judicious advice would almost invariably follow the line of least resistance; that is, select his elective subjects with the hope of avoiding as much serious effort as possible, and without due regard for harmony, proportion, or future consequences. The wise principal can wield his greatest

influence over the destinies of his pupils at this point. He should, as far as possible, arrange his elective courses so that any student, having completed any one of them, will be in line for advanced study, if he should find that his tastes and ambition lead him in this direction.

# High-School Course of Study.

( Suggestive. )

## First Year.

### FIRST SEMESTER.

Required :

English.  
Algebra.

Electives (choose two):

Latin.  
Physiography.  
Greek and Roman history.  
Manual training.

### SECOND SEMESTER.

Required :

English.  
Algebra.

Electives (choose two):

Latin.  
Physiography.  
Greek and Roman history.  
Manual training.

## Second Year.

### FIRST SEMESTER.

Required :

English.  
Algebra.

Electives (choose two):

Latin.  
German.  
Botany.  
M. and M. history.  
Physiology.  
Manual training.

### SECOND SEMESTER.

Required :

English.  
Geometry.

Electives (choose two):

Latin.  
German.  
Botany.  
M. and M. history.  
Physiology.  
Manual training.

## Third Year.

### FIRST SEMESTER.

Required :

English.  
Geometry.

Electives (choose two):

Latin.  
German.  
Chemistry.  
Zoology.  
English history.  
French.  
Agriculture.

### SECOND SEMESTER.

Required :

English.  
Geometry.

Electives (choose two):

Latin.  
German.  
Chemistry.  
Zoology.  
English history.  
French.  
Agriculture.

## Fourth Year.

### FIRST SEMESTER.

Electives (choose four):

English.  
Physics.  
Latin.  
German.  
American history.  
Trigonometry.  
Bookkeeping.  
Economics.  
French.  
Review common branches.

### SECOND SEMESTER.

Electives (choose four):

English.  
Physics.  
Latin.  
German.  
American history.  
Advanced algebra.  
Bookkeeping.  
Economics.  
French.  
Review common branches.

The foregoing course is designed to guide the principal or superintendent in making out a course which shall provide entrance to the University of Kansas and all accredited colleges of the state, and also take into account local conditions. When such a course is arranged for a particular school, it will include only four subjects in each semester, somewhat as follows:

## **Suggestive College Preparatory Course for High Schools having only Three Teachers.**

### **First Year.**

#### **FIRST TERM :**

English.  
Algebra.  
Latin or German.  
History (Greek).

#### **SECOND TERM :**

English.  
Algebra.  
Latin or German.  
History (Roman).

### **Second Year.**

#### **FIRST TERM :**

English.  
Algebra.  
Latin or German.  
Botany.

#### **SECOND TERM :**

English.  
Geometry.  
Latin or German.  
Botany.

### **Third Year.**

#### **FIRST TERM :**

English.  
Geometry.  
Latin or German.  
M. and M. History.

#### **SECOND TERM :**

English.  
Geometry.  
Latin or German.  
M. and M. History.

### **Fourth Year.**

#### **FIRST TERM :**

Physics.  
American History.  
Latin.  
(Select one subject.)

#### **SECOND TERM :**

Physics.  
American History.  
Latin.  
(Select one subject.)

## Entrance Requirements.

### College of Liberal Arts and Sciences.

Professor OLIN TEMPLIN, A. M., Dean.

#### Admission.

There are two methods of admission to the College of the University: First, by examination; second, by certificate.

1. BY EXAMINATION.—Candidates for admission to first-year work in the College of the University, not presenting the required certificate, will be examined at the University, Lawrence.

Candidates for admission may divide the examination between two years, or between June and September of the same year, under the following conditions: The applicant may present himself at the preliminary for examination in any or all of the prescribed subjects, and, if he is successful in five or more subjects, he need not be again examined in them.

Examinations for advanced standing on work done in preparatory schools, not required for admission, will be held at the same time as entrance examinations above.

2. BY CERTIFICATE.—Nearly all students enter the College by certificate from high schools, academies, preparatory schools of other colleges and universities, or from military schools, accredited by the University.

The candidate for admission by certificate must present either a certificate of graduation from an accredited preparatory school, or a letter from the principal of such school recommending him for admission without graduation. The certificate should be signed by the principal or other executive officer of the school. Blank certificates will be sent by the Registrar of the University about May 1 of each year to the principal of each accredited school. The certificates of all expecting to enter the College of the University should be filled out, signed and returned by the principal or other officer to the Registrar before June 1. The accredited list is the same for all schools of the University.

Blank certificates will be sent on application to the Registrar.

ENTRANCE UNIT. Preparatory work [is estimated in terms of the "entrance unit." A subject (like algebra, for example) run-

ning one year—*i. e.*, thirty-five weeks, five recitations per week, with at least forty minutes for each recitation—constitutes one “entrance unit.” In computing entrance units, the laboratory period should be twice the length of a recitation period.

Fifteen units are necessary for unconditional admission to the College. A temporary deficiency, however, of not more than three units will be permitted, but the deficiency in any “group” given below must not exceed one unit. A student thus conditioned must make good all of his deficiencies during his first year in the University. Deficiencies thus made good do not count as College work.

**MAKING UP DEFICIENCIES.** In making up deficiencies at the University, a “College unit”—*i. e.*, five hours a week for a half-year (one term)—is considered equivalent to an “entrance” (or high-school) “unit,” as above defined.

College credit for work done in preparatory schools will be given upon examination only.

### Subjects for Admission.

The subjects from which entrance work may be offered, together with the number of units, are arranged in six groups, as follows; a total of fifteen units must be offered:

GROUP I, English.	{ English, four units.	{ Three units are required.
GROUP II, Mathematics.	{ Elementary algebra, one and one-half units. Plane geometry, one unit. Solid geometry, one-half unit. Plane trigonometry, one-half unit. Advanced algebra, one-half unit.	{ The elementary algebra and plane geometry are required.
GROUP III, Foreign Languages	{ Latin, four units. Greek three units. German, three units. French, three units.	{ Of these, three units are required, which must be, first, in Latin, or, second, in German.
GROUP IV, Physical Sciences.	{ Physical geography, one unit. Physics, one unit. Chemistry, one unit.	{ One unit is required.
GROUP V, Biological Sciences.	{ Botany, one unit. Zoölogy, one unit. Physiology, one unit.	{ One unit is required.
GROUP VI, History.	{ Greek and Roman, one unit. Medieval and modern, one unit. English, one unit. American, one unit. Economics, one unit.	{ One unit is required.

As observed above, to secure unconditional admission to the Freshman class of the College, the candidate must offer fifteen units from the foregoing list of accredited preparatory subjects. Of these fifteen units, eleven and one-half are prescribed by group; the remaining three and one-half units may be chosen without restriction.

In view of the difficulty some preparatory schools may have in expanding their courses of study so as to include all the required units, until further notice, candidates will be admitted unconditionally who offer fifteen units from the foregoing list, only eight and one-half units of which number are specifically required. These required subjects are, three units of English, three units of foreign language, two and one-half units of mathematics.

Students who take advantage of this privilege of postponing prescribed entrance requirements must make good such deferred requirements during their first year in the College. A course so taken during the Freshman year not only satisfies the entrance requirements, but also counts as regular College work.

It is hoped that within a reasonable time all Kansas high schools will be able so to arrange their courses of study as to meet all the entrance requirements of the University.

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## **School of Engineering.**

Professor FRANK O. MARVIN, A. M., Dean.

### **Admission.**

There are two methods of admission to the School of Engineering of the University: First, by examination; second, by certificate.

The conditions for entering by examination are the same as those of the College.

Nearly all students enter the School of Engineering by certificate from high schools, academies, preparatory schools of other colleges and universities, or from military schools, accredited by the University. The candidate for admission by certificate must present either a certificate or other credential, as noted in connection with admission to the College. The same rules apply in regard to admission by certificate to the School of Engineering as apply for admission to the College.

All deficiencies must be made good within such time as may be fixed in each individual case by the Dean of the School of Engineering.

Applicants for admission are advised to come without deficiencies, and to be especially well prepared in algebra and geometry.

**Subjects for Admission.**

Fifteen units are required for admission.

REQUIRED.		OPTIONAL.	
Mathematics 1, 2, 3, algebra and plane and solid geometry	3 units.	Latin 1, 2, 3,	3 units.
English 1, 2, 3,	3 "	German 1, 2, 3,	3 "
Physics	1 "	French 1, 2, 3,	3 "
Free-hand drawing	1 "	Greek and Roman history	1 "
Foreign language—may be French or German or Latin; 3 units of one, or 2 units of any one and 1 unit of any other,	3 "	English history	1 "
		American history	1 "
		Chemistry	1 "
		Higher algebra and plane trigonometry }	1 "
		Physical geography	1 "
		Botany	1 "
		Zoölogy	1 "
		Economics	1 "
		Manual training	1 "
Required, 11 units.			
Optional, 4 units.			
Total, 15 units.			

Four units must be chosen from the optional list.

For any advanced rank, the applicant must have completed all of the studies of the course below the rank for which he applies, including the entrance requirements or their substantial equivalent, as determined by the committee on advanced standing. Applications for credits in single subjects will also be passed upon by this committee.

**SPECIAL STUDENTS.** Opportunity is given in the School of Engineering for the admission of persons of mature years who desire to pursue some special line of work, without following any prescribed course or becoming candidates for a degree. The admission of such special students is directly under the control of the Dean of the School of Engineering, whose certificate of acceptance must be presented to the Registrar before registration. Applicants for standing as special students must present satisfactory evidence of proper preparation for the studies desired and must also meet other requirements as fixed by the Faculty. Special students are subject to the same regulations as regular students with regard to the quality of work performed and attendance at recitations and examinations, but not as to number of studies to be pursued.

**INADEQUATE PREPARATION.** When students show by their current work insufficient entrance preparation in any study, they may be required to make good such deficiency in any manner prescribed by their instructors.

## **School of Law.**

Professor JAMES W. GREEN, A. M., Dean.

### **Admission.**

For entrance to the School of Law, candidates are required to offer fifteen units of work, which must be selected from the six groups prescribed for entrance to the College. The conditions for admission by certificate are the same as those in the College.

Candidates for admission to the Junior class of the School of Law who cannot bring certificates are required to be examined in all the subjects required for entrance, and the time and place of examination are the same as in the College.

Persons who have privately completed a part of the course are admitted to advanced standing in the Junior and Middle classes on satisfying the Faculty as to their qualifications. No one will be so admitted to the Senior class except upon passing a satisfactory examination upon the requirements for admission, and also upon the work prescribed for the Junior and Middle classes.

Certificates of work done in other law schools of recognized standing and equivalent requirements may be received in lieu of examinations for advanced standing.

**SPECIAL STUDENTS.** Opportunity is given in the School of Law for the admission of persons of mature years who desire to pursue special work, without following any prescribed course or becoming candidates for a degree. The admission of such special students is directly under the control of the Dean of the School, whose certificate of acceptance must be presented to the Registrar before registration. Applicants for standing as special students must present satisfactory evidence of proper preparation for the studies desired, and must also meet other requirements as fixed by the Faculty. Special students are subject to the same regulations as regular students with regard to the quality of work performed and attendance at recitations and examinations.

## **School of Medicine.**

Professor M. T. SUDLER, Dean of Scientific Department.

Professor GEO. H. HOXIE, Dean of Clinical Department.

### **Admission.**

The standard of entrance to the medical course will be graduation from a four-year high-school course, with such conditions as are now allowed for entrance to the College.

There are two methods of admission: First, by examination; second, by certificate.

**BY EXAMINATION.** Students who cannot present certificates from accredited schools will be examined in the subjects required for admission, indicated under the College of Liberal Arts and Sciences. Subjects upon which the candidate will be examined are the same as those required for admission to the College.

**BY CERTIFICATE.** Nearly all students enter the School of Medicine on certificates from high schools, academies, and other preparatory schools. The method of accrediting by certificate is the same as that in the College. Graduates of state normal schools or of high schools or academies outside of the state of Kansas, whose credits are accepted by another state university, may be admitted under the same condition.

**UNITS REQUIRED.** The time value of each study is stated in units, a unit meaning one high-school study pursued daily for at least thirty-five weeks. A total of fifteen units is required for entrance. A student may be conditioned in not more than three units.

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## **School of Pharmacy.**

Professor LUCIUS E. SAYRE, Ph. M., Dean.

### **Admission.**

There are two methods of admission to the School of Pharmacy: First, by examination; second, by certificate.

Candidates may enter the School of Pharmacy on certificates from any of the accredited high schools. The plan of entrance by certificate is noted under The College.

Candidates for admission to the two-year and three-year courses must present certificates of graduation from accredited schools, or, in lieu of this, must present certificate covering work equal to that covered by graduation from the eighth grade of a grammar school.

in arithmetic, United States history, geography, English grammar, and civil government, and, in addition, either be examined in, or present certificates from high schools, academies or colleges for, physics, Carhart and Chute, or equivalent, and Latin, Bennett's Latin Grammar, or equivalent. These latter subjects, in which the student may be deficient, may be made up during the first year of attendance, either in a special class or at the Lawrence high school.

Candidates for admission to the four-year course must conform, by examination or certificate, to the requirements for entrance to the Freshman year of the College.

SPECIAL STUDENTS, not candidates for a degree, may be admitted to the School of Pharmacy without conforming to the requirements for entrance. The admission of such students is under the control of the Dean, and his certificate of recommendation must be procured before the candidate presents himself to the Registrar.

## Entrance Requirements Defined.

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### ENGLISH. *Three units.*

The requirements in English for admission to the University of Kansas—requirements that are now standard for all American colleges—as formally stated comprise only English literature, meaning classics chiefly, and English composition. As originally formulated, these requirements were defined by stating as follows the nature of the examination to be based upon them:

“I. READING.—A certain number of books will be set for reading (see list subjoined). The candidate will be required to present evidence of general knowledge of the subject-matter, and to answer simple questions on the lives of the authors. The form of examination will usually be the writing of a paragraph or two on each of several topics to be chosen by the candidate from a considerable number—perhaps ten or fifteen—set before him in an examination paper. The treatment of these topics is designed to test the candidate's power of clear and accurate expression, and will call for only a general knowledge of the substance of the books. In place of a part or the whole of this test, the candidate may present an exercise book, properly certified by his instructor, containing compositions or other written work done in connection with the reading of the book. In preparation for this part of the requirement, it is important that the candidate shall have been instructed in the fundamental principles of rhetoric.

“II. STUDY AND PRACTICE.—This part of the examination presupposes the thorough study of each of the works named in this division. The examination will be upon subject-matter, form, and structure. In addition, the candidate will be required to answer questions involving the essentials of English grammar, and on the leading facts of the periods of English literary history to which the prescribed texts belong.

“NOTE.—No candidate will be accepted in English whose work is notably defective in point of spelling, punctuation, idiom, or division into paragraphs.”

The list of classics recommended for the examinations occurring in September, 1907, and September, 1908, is as follows:

#### FOR GENERAL READING AND COMPOSITION WORK.

Shakspeare—The Merchant of Venice.

“ —Macbeth.

Addison—The Sir Roger de Coverley Papers.

Irving—Life of Goldsmith.

Coleridge—The Rime of the Ancient Mariner.

Scott—Ivanhoe.

“ —The Lady of the Lake.

Carlyle—Essay on Burns.

Tennyson—Gareth and Lynette.

“ —Lancelot and Elaine.

“ —The Passing of Arthur.

Lowell—The Vision of Sir Launfal.

Eliot—Silas Marner.

#### FOR CAREFUL STUDY.

Shakspeare—Julius Cæsar.

Milton—Minor poems (Lycidas, Comus, L'Allegro, Il Penseroso.)

Burke—Speech on Conciliation with America.

Macaulay—Life of Johnson.

“ —Essay on Addison.

Since the adoption of the requirements thus indicated, supplementary recommendations have been made from time to time with intent to make clearer the real meaning and intent of those requirements. Among the first of these supplementary recommendations was the following group:

1. That English be studied throughout the primary and the secondary school courses, and when possible for at least three periods a week during the four years of the high-school course.

2. That the prescribed books be regarded as a basis for such wider courses of English study as the schools may arrange for themselves.

3. That where careful instruction in idiomatic English translation is not given, supplementary work to secure an equivalent training in dictation and in sentence-structure be offered throughout the high-school course.

4. That a certain amount of outside reading, chiefly of poetry, fiction, biography, and history, be encouraged throughout the entire school course.

5. That definite instruction be given in the choice of words, in the structure of sentences and of paragraphs, and in the simple forms of narration, description, exposition, and argument. Such instruction should begin early in the high-school course.

6. That systematic training in speaking and writing English be given throughout the entire school course. That in the high school, subjects for compositions be taken partly from the prescribed books and partly from the student's own thought and experience.

7. That each of the books prescribed for study be taught with reference to: (a) The language, including the meaning of words and sentences, the important qualities of style, and the important allusions. (b) The plan of the work, *i. e.*, its structure and method. (c) The place of the work in literary history, the circumstances of its production, and the life of its author. (d) That all details be studied, not as ends in themselves, but as means to the comprehension of the whole.

To these recommendations a paragraph on grammar has since been added :

The student should have a sufficient knowledge of English grammar to enable him at need to point out the syntactical structure of any sentence which he encounters in the prescribed reading. He should also be able to state intelligently the leading grammatical principles when he is called upon to do so. Whether this knowledge is obtained in the elementary school and the secondary school combined, or only in the elementary school, is immaterial, provided the student have it; but in most cases it cannot be acquired except through regular study and practice in the lower grades, and scarce through these. A progressive and regular development of the grammar sense, from the lowest grades to the highest, is much to be preferred to a sudden and unprepared for injection of formal grammar at a particular stage, as, for example, in the eighth grade.

With reference to the teaching of composition, teachers have been advised in still other recommendations that composition work should be oral as well as written, that such work should be continuous throughout the entire high-school course, and that text-books in rhetoric or composition are by no means essential to successful training, but are to be used with great discretion. Other suggestions have been that the studies of composition and of classics be correlated throughout the high-school course in the proportion of about three recitation periods weekly of classics to two periods of composition, and that the length of the English course indicated be three years of five recitation periods weekly.

It was intended that the list of classics suggested for general reading should be varied at pleasure and that it should be freely supplemented with other books of similar character, and with the collateral outside reading of biography and history. To emphasize that point a list was published\* of 120 classics from which alternative selections might be made to meet any special conditions. While it was not thought best to exercise the same degree of freedom in modifying the list of classics prescribed for careful study, some flexibility seemed advisable here also. The result has been that, as revised for the years 1909, 1910, and 1911, both lists have been modified so as to allow a certain range of choice, and the first list is greatly extended. Following are the revised lists for the three years named :

#### FOR READING.

##### GROUP I (two books to be selected):

Shakspeare—As You Like It.

“ —Julius Cæsar.

“ —The Merchant of Venice.

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\* N. E. A. Report of Committee on Entrance Requirements, July, 1899, pp. 18, 19.

Shakspere—Twelfth Night.

“ —Henry V.

**GROUP II (one book to be selected):**

Bunyan—The Pilgrim's Progress, part I.

Bacon—Essays.

Addison—De Coverley Papers (“Spectator”).

Franklin—Autobiography.

**GROUP III (one book to be selected):**

Chaucer—Prologue.

Spenser—Selections from Faerie Queene.

Pope—The Rape of the Lock.

Goldsmith—The Deserted Village.

Palgrave—Golden Treasury (first series), books II and III, with especial attention to Dryden, Collins, Gray, Cowper, and Burns.

**GROUP IV (two books to be selected):**

Hawthorne—The House of the Seven Gables.

Thackeray—Henry Esmond.

George Eliot—Silas Marner.

Dickens—A Tale of Two Cities.

Scott—Ivanhoe.

“ —Quentin Durward.

Goldsmith—The Vicar of Wakefield.

Mrs. Gaskell—Cranford.

Blackmore—Lorna Doone.

**GROUP V (two books to be selected):**

Emerson—Essays (selected).

Ruskin—Sesame and Lilies.

Irving—Sketch Book.

Carlyle—Heroes and Hero-worship.

De Quincey—Joan of Arc and the English Mail-coach.

Lamb—Essays of Elia.

**GROUP VI (two books to be selected):**

Palgrave—Golden Treasury (first series), book IV, with especial attention to Wordsworth, Keats, and Shelley.

Coleridge—The Ancient Mariner.

Lowell—The Vision of Sir Launfal.

Scott—The Lady of the Lake.

Poe—Poems.

Tennyson—Gareth and Lynette, Lancelot and Elaine, and The Passing of Arthur.

Arnold—Sohrab and Rustum.

Byron—Mazeppa and The Prisoner of Chillon.

Longfellow—Courtship of Miles Standish.

Browning—Cavalier Tunes, The Lost Leader, How They Brought the Good News from Ghent to Aix, Evelyn Hope, Home Thoughts from Abroad, Home Thoughts from the Sea, Incident of the French Camp, The Boy and the Angel, One Word More, Herve Riel, Pheidippides.

Macaulay—Lays of Ancient Rome.

#### FOR STUDY AND PRACTICE.

Shakspeare—Macbeth.

Milton—Lycidas, Comus, L'Allegro, and Il Penseroso.

Burke—Speech on Conciliation with America.

Macaulay—Life of Johnson.

#### ALTERNATIVES.

##### FOR BURKE:

Washington—Farewell Address; and also

Webster—First Bunker Hill Oration.

##### FOR MACAULAY:

Carlyle—Essay on Burns.

Within the indicated limits, the choice of the books to be read, their arrangement, and the order of study, are left to the teacher, and must vary with circumstances. In a general way, it may be advisable to undertake to study later writers before earlier ones, American before English, prose before verse, narrative and concrete literary types before those that are reflective and abstract. But since all these principles cannot be applied at once, any combination of them will serve that, under the conditions of each case, seems to be the order of increasing interest and of easiest approach to difficulties, and will at the same time coordinate the study of classics with that of composition. The only text-books needed, except for reviewing the history of the periods concerned are editions of the classics themselves; and the reading of them should be accompanied with such discussion as will best serve to aid students to appreciate the form, style, and spirit of the books read, as well as to understand their subject-matter and their general relations, historical and personal.

If it were assumed that the high-school course was to include only the books named in the lists for 1907 and 1908, it would be very hard to arrange them in accordance with the suggestions of the preceding paragraph, since the selections assigned for careful study in class include no fiction or simple verse, such as is easiest to begin with, and since in the entire list there is but one short poem to represent the whole of American literature. If

American prose and verse have received some attention in the grades, and if pupils have learned in the grades or at home to like books, and to think and talk about them, that list is not so objectionable as it otherwise must be; but still it is much too short to afford material representing either periods or literary types with anything like the fulness that is desirable. The revised list for 1909, 1910, and 1911 is not in the same degree open to this objection.

But with either list as the basis of study it will often be expedient, before taking up in class the works prescribed for careful study, to spend some time upon a part of the fiction and later verse in the home-reading list, in order to show such pupils as may need it how the home-reading and study may be carried on. To do this will be the more necessary and will take longer if the class has had no satisfactory training before entering the high school. Afterward, when this preliminary study of fiction and verse has been completed, and the pupil continues such reading outside of class while working in class on the books prescribed for careful study, the results of his outside reading should still be constantly tested by making it as often as necessary the subject of class discussions and of written reports and essays. Although not specifically mentioned in the reading list, the outside reading is always to include biographical and historical matter relating to the authors, the texts, and the periods represented.

Arranged in general accordance with these principles, and without additions of any kind, the following order of study has been suggested in the University catalogue for the classics listed for examination in 1907 and 1908:

IN CLASS.

Eliot.—Silas Marner; parts, or general survey and discussion.

Lowell.—Vision of Sir Launfal, entire; rapid reading and general discussion.

Macaulay.—Essay on Addison.

Macaulay.—Life of Johnson.

These studied, first, as examples of Macaulay's style and method; second, for information about Milton and Addison.

Burke.—Speech on Conciliation; studied as an example of style and of method in argument as well as for subject-matter.

OUT OF CLASS.

Eliot.—Silas Marner; completed.  
Scott.—Ivanhoe; while Lowell is under discussion in class.

Tennyson.—Selections named in list.

Scott.—The Lady of the Lake.  
Coleridge.—The Ancient Mariner.  
These read after Lowell, while Macaulay is under discussion in class.

Irving.—Life of Goldsmith.

Carlyle.—Essay on Burns.

To follow Macaulay, while Burke is being studied in class.

## IN CLASS.

Milton.—Minor Poems; compared with verse of nineteenth century.

Shakspeare.—Julius Cæsar; intensive study.

## OUT OF CLASS.

Addison.—Sir Roger de Coverley Papers; compared with nineteenth century essays, while Milton is continued in class.

Shakspeare.—Merchant of Venice—Macbeth.

## General chronological review.

After thus tabulating the recommended classics, it is obvious that in three years there is ample time for reference reading, and for the rapid reading of other classics besides these. The dividing of this three-year course into one-year units is a matter that may be governed by circumstances or by the convenience of the teacher. The course should be viewed as a whole and taught as a whole, without other than necessary reference to years and terms. If the indicated order be followed, perhaps the most convenient division would end the work of the first year with Macaulay and Coleridge, that of the second with Milton and Addison, and would give the third year to Shakspeare and the general review.

In arranging the classics in the revised list for 1909, 1910, and 1911 there is opportunity to make use of a larger proportion of material by American writers, and it seems advisable to spend even more time in the preliminary study in class of nineteenth-century fiction and verse, passing from American writers to English, and from later to earlier, and making careful comparisons of one with another at each step of the process. The following outline includes, perhaps, the simplest of the various options offered, except that Burke's Speech on Conciliation is retained because of its peculiar value and adaptability for every sort of analysis. For all but a few of the classics named, alternatives may be substituted at pleasure from the prescribed list:

## IN CLASS.

*Fiction.*

## OUT OF CLASS.

Hawthorne.—House of the Seven Gables. Begin in class, finish outside if necessary.

Eliot.—Silas Marner, after completing Hawthorne. Contrast American and English traits, and if possible compare the Vicar of Wakefield as an eighteenth-century novel.

*Verse.*

Lowell.—Vision of Sir Launfal. Compare American with English, later with earlier. If convenient, read also The Cotter's Saturday Night before beginning Carlyle's Essay on Burns.

Coleridge.—The Ancient Mariner.

Goldsmith.—Deserted Village. Reference and other collateral reading as required.

IN CLASS.

*Essay.*

OUT OF CLASS.

Carlyle.—Essay on Burns.  
Study for style and method as well as subject-matter, with comparisons as previously suggested.

Irving or Emerson.—Selected essays.  
Lamb.—Essays of Elia.

*Public Address.*

Burke.—Speech on Conciliation. Extended reference reading.

*Earlier Verse and Prose.*

Milton.—Lycidas, Comus, L'Allegro and Il Penseroso.

Bunyan.—Pilgrim's Progress, Part I.

*Drama.*

Shakspeare.—Macbeth.

Shakspeare.—Two plays selected from list.

General historical review.

In this outline the first year's work might include Carlyle, the second Burke and Milton, and the third Shakspeare and the historical review. Shakspeare and Milton may, of course, be interchanged at pleasure, and the general order may be otherwise varied in any way that will best serve the general end of making the work interesting and profitable.

The preceding arrangement is such that as a rule no classic is read at home until part of it or until a similar one has been studied in class. The purpose of this is to insure a fuller appreciation of the books read at home. That the pupil may in his class-study have passed on to another type of literature, does not make any difficulty. When a classic has been assigned for home reading, a recitation period may be spent in the preliminary discussion of it, and essay subjects relating to it may then be assigned; when the home reading of it is completed at least one or two recitation periods may be spent in reviewing it, and some of the essays may then be presented in class. Whenever time presses, a longer classic, the reading of which has been begun in class, may be completed out of class, provided always that the teacher sees to it that, by means of final discussion or otherwise, the work shall be understood as a whole, and that its literary or artistic unity shall be the chief thing to be impressed on the minds of the pupils.

The class study of literature is intended to be much more thorough, and therefore much more critical, than the collateral home reading. It must be systematic, and yet no single system or method can be made to apply to all the books studied. Indeed, it might be said that if a method of study proves satisfactory with one book or class, or in the hands of one teacher, that is an excellent reason

why it is likely not to be satisfactory with another book or class or teacher. Certain things, however, may be indicated as belonging in general to the critical study of literature; and in taking up the study of a classic the teacher must decide which or how many of them may profitably be applied in that instance, and must be ready to supplement them with others. Such a list of what may be called points of attack upon a classic is as follows:

A.—The meaning of the classic; interpretation and abstract; the clearing up of all difficulties of words or phrases, figures and allusions; the analysis of logical structure, the determining of important events and characters and of the central lesson or purpose of the work as a whole.

B.—The style of the classic; study of selected passages, to note distinctive peculiarities of language or structure and to determine which of them contribute to the merit of the work or throw light upon the personality of the author.

C.—The method of the classic, logical or artistic; after the interpretation is completed, deciding to what type or class of literature it belongs and developing as far as may be some of the principles upon which that classification is based.

D.—Relation of the author to the classic; the study of his purpose and motive and of his reasons for his choice of subject and of form, of his attitude toward his work, his general habit of thought, and so on.

E.—General relations of the classic, historical and literary; after the collateral reference reading is completed, study of the historical basis of the work, its place in literary development, its influence, and so on.

F.—General review and summary of whatever matters have been taken up for special study; selection of best parts and passages, and general estimate of the literary value of the work.

With a beginning class, and with some books of less importance, it might be best to confine attention to topics A and F of this list. With a class a little more advanced, and with suitable books, other topics may be introduced. A new topic of study may receive a greater proportion of time than those earlier considered; and it is necessary to be very careful not to take up too many points in the study of any one book; its central meaning and unity, its distinctive purpose, relations and merit, are among the chief things to be kept in view.

The correlation of the studies of composition and of classics consists not only in carrying them on side by side, but in making use of the books read to illustrate the principles of expression which students may apply to their own speech and writing, in assigning subjects which will require independent critical reading of books in hand, or reading for information on special topics, and, so far as

is convenient, in keeping to the same general order of subjects in both studies, so that the work done in each may reenforce that of the other. Abstracts and summaries of books read should never be required as composition exercises except when absolutely necessary, as they hinder the growth of that independence of view which is essential in the critical study of literature. To maintain and develop ease and originality of expression, fully half of the composition exercises should be based on the student's experience; that is, on his present or past observation; and on occasion exercises may be partly or wholly imaginative.

Composition and rhetoric are not to be regarded as distinct subjects in the high-school course. A rhetoric is merely a text-book in composition; and in the study of composition, as in that of literature, the use of formal text-books is purely an incidental matter. The principal part of the work must always be the preparation and discussion of oral and written exercises. Such an exercise of some kind, longer or shorter, should be a part of every lesson, and probably at least one exercise every week should be a written exercise of some length.

Points that may be successively considered in a course in composition are: the structure of discourses, of paragraphs, and of sentences, the choice and use of words, and the nature and more general principles of narration and description, exposition and argument. Throughout the course, the most important objects to keep in view are the securing of easy and spontaneous expression, and the adapting of material to the person or public addressed. To accomplish these most successfully the work may well begin with the preparation of stories—that is, of narrative or descriptive exercises based on observation or imagination; then may follow the preparation of essays presenting reflective material derived from all sources, and the study of theme, plan, and paragraphs; then, with any sort of material or treatment, may be taken up the study of sentences and words, and the general principles of style; and finally, the general principles of all forms of discourse, and in particular of narrative and exposition, may be considered with appropriate material and exercises. Any text-book may be used, in so far as it is found to be suitable and helpful; but no text-book should be followed too closely, and no topic or exercise assigned if there is no better reason for assigning it than that it is to be found in the book.

Under no circumstances should a period be spent in memoriter recitation upon any text; if there can be no practical illustrative exercise of any kind, the study of rhetorical theory is of little worth except for such incidental aid as it may furnish toward the

appreciation of literature, and this is too little for the time expended. Often the work in composition may be done to the best advantage without the use of any text or texts whatever, except for reference and in reviewing.

Any division according to years or terms of the subjects named must be discretionary, to suit the conditions of individual schools or of individual classes or teachers. The following general arrangement by years is therefore purely tentative, to be followed only when no better plan can be found. It includes classics as well as composition, in the order already specified :

## FIRST YEAR.

## IN CLASS.

## OUT OF CLASS.

*Literature.* Three periods weekly.  
House of Seven Gables, in part.  
Vision of Sir Launfal.  
Essay on Burns.  
Other books as selected.

House of Seven Gables, completed.  
Silas Marner.  
The Ancient Mariner.  
Deserted Village.  
Essays of Irving or Emerson, and Lamb.  
Reference-reading of biography, history, etc.

*Composition and Rhetoric.* Two periods weekly.

The finding, shaping and adapting of material, in written and oral exercises; stories, letters, essays, study of theme, plan, and paragraph.

## SECOND YEAR.

## IN CLASS.

## OUT OF CLASS.

*Literature.* Three periods.  
Speech on Conciliation.  
Minor Poems of Milton.  
Other books as selected.

Reference reading.  
Pilgrim's Progress, part I.

*Composition and Rhetoric.* Two periods.

The principles of style, in written and oral exercises; stories, letters, essays, study of sentence structure and of choice and use of words, study of paragraphs, translation, synonyms, figures, verse forms, etc.

## THIRD YEAR.

## IN CLASS.

## OUT OF CLASS.

*Literature.* Three periods.  
Macbeth.  
Other books as selected.  
General historical review.

Two selected plays of Shakespeare.  
Reference reading.

*Composition and Rhetoric.* Two periods.

The forms of discourse; stories, letters, essays, study of nature and principles of narration and description, exposition and argument.

To secure the continuous study of English through the four years of a high school either of two methods may be followed. If practicable, it is of advantage for all students, and particularly for such as do not afterward enter college, to add a fourth year of English to the three full years herein described as a college-entrance requirement. If this is not practicable, the three years' work may be distributed through four years by assigning to it fewer than five recitation periods a week in the last two years, so that the total time given it is not increased.

An excellent four-year course in English may be made by simply arranging for the reading of a greater number of the classics listed as alternatives for 1909, 1910, and 1911, with some few additions, as here shown. Year divisions cannot be prescribed, though they may correspond roughly to the successive centuries as indicated. The composition work for the first three years may be as indicated in the preceding table; for the fourth year it may consist of regular essay writing.

## FOUR-YEAR ENGLISH COURSE.

### NINETEENTH CENTURY.

#### *American Fiction; the short story.*

(This part of the course may be given in the grades.)

#### IN CLASS.

Selections from  
Irving.—The Sketch-book.

#### OUT OF CLASS.

Selections from  
Hawthorne.—Twice Told  
Tales.  
Poe.—Tales.

#### *American and English Fiction; longer works compared with short stories.*

(Part of this work may be done in the grades.)

Hawthorne.—House of Seven  
Gables begun. One book selected from Eliot, Scott, Dickens, Gaskell, or Blackmore (see list).

Hawthorne.—House of Seven  
Gables completed. The remaining books listed from Eliot, Scott, Dickens, Gaskell, and Blackmore.

#### *American Verse.*

(Books interchangeable at pleasure.)

Lowell.—Vision of Sir Launfal.

Longfellow.—Courtship of Miles  
Standish.  
Poe.—Poems.

*English Verse, compared with American.*

(Books interchangeable at pleasure, and so below.)

## IN CLASS.

## OUT OF CLASS.

Coleridge.—Ancient Mariner.

Books listed from Scott, Byron, Tennyson, Browning, Arnold, Palgrave's Golden Treasury.

*American Essay.*

Selections from Emerson.

Selections from Irving and Holmes.

*English Essay.*

Carlyle.—Essay on Burns.

Books listed from Lamb, Ruskin, Carlyle, DeQuincey.

## EIGHTEENTH CENTURY.

*Fiction.*

Goldsmith.—Vicar of Wakefield, begun.

Goldsmith.—Vicar of Wakefield, completed.  
Johnson.—Rasselas.  
DeFoe.—Robinson Crusoe.  
Selections from Gulliver's Travels.*Verse.*

Goldsmith.—Deserted Village.

Books listed from Pope, Macaulay, and Palgrave's Golden Treasury.

*General Prose.*Burke.—Speech on Conciliation.  
Macaulay.—Life of Johnson.Addison.—Papers from "Spectator."  
Franklin.—Autobiography.

## SEVENTEENTH CENTURY.

*Verse.*

Milton.—Minor Poems.

Milton.—Selections from Paradise Lost  
Selections from Palgrave's Golden Treasury.*Drama.*

Shakspeare.—Macbeth.

Shakspeare.—Two or more plays selected from list.

*Prose.*Bacon.—Selected Essays.  
Selections from King James's Bible, *e. g.*, the Book of Job.  
(May be taken from Modern Reader's Bible.)Bunyan.—Pilgrim's Progress.  
Bible Selections, *e. g.*, Psalms, Proverbs, Lamentations, Ecclesiastes. (Modern Reader's Bible.)

EARLIER LITERATURE.

IN CLASS.

Chaucer. — Prologue.  
Spenser. — Selections from *Færie*  
*Queene*.

OUT OF CLASS.

Chaucer. — Selections from *Can-*  
*terbury Tales*.  
Spenser. — Selections from  
*Færie Queene*.  
Selections from Old English, in  
translation.

Historical review.

Students who offer, with the approval of the High-school Visitor, the equivalent of this four-year course in English for entrance to the University, may be excused from taking in the University the English literature course of the Freshman year, which is otherwise required for admission to any other University courses in English.

At option any high school may add to the regular three-year course in English a fourth year of either English language or English composition, and have the same accepted as one of the fifteen required entrance units. A one-year course in English language may begin with the study of elementary Old English—grammar, prose composition, and readings from the simplest prose and verse. Then may follow the history of the English language and grammar after the Old English period, with particular attention to orthography, pronunciation, word composition and derivation, inflections and syntax; and the course may be completed with the study of Middle English for the rest of the available time. Good text-books for such a course as this are Smith's *Old English Grammar* for the Old English part, Champney's *History of English* or Emerson's *History of English* for the historical part; and for the study of Middle English either or both of Sweet's *First and Second Middle English Primers*, or the school editions of Chaucer's *Prologue to the Canterbury Tales*, and the *Knights Tale*.

In a year of English composition to follow the regular three-year course, the time may be given chiefly to the study of the principal forms of discourse, narrative and descriptive, expository and argumentative, with daily practice in adapting these to all purposes and occasions for which speaking or writing is demanded, with especial reference to purpose and occasion and to the character of the person or public to be addressed. With this there should be a large amount of collateral study of literary selections illustrating the several types of oral and written address as they are taken up for study and practice.

To be accepted by the University, a four-year course in English, or a fourth year of English, must have the approval of the Uni-

versity High-school Visitor; and if accepted, students who offer it will be excused from a corresponding part of their college English. Entrance certificates must show in complete detail the nature of the high-school English course, and especially of the fourth unit, if offered.

If any course herein outlined seems too heavy, it may be lightened by omission, or by having some part of the earlier work done in the grades. In any case, whether three or four years in length, the high-school English course is to be planned and taught as an integral thing, and not as a series of detached one-year units. It is to be taught without reliance upon any particular text-book, and with regard for results rather than methods. The University and the business world alike wish to have high-school pupils trained to see and think for themselves in the study of books as well as of nature and of men; and trained to express what they see and think with readiness, ease, and reasonable accuracy. Whatever books or methods lead most efficiently to these general ends may reasonably be approved; and exact uniformity in courses or in the work of individual teachers, or in the work of the same teacher in successive years, is neither prescribed or expected.

The number of good text- and reference-books in English is now so great that it is scarcely practicable to specify any one as being the best of its class. Editions of the classics listed in the requirements for college entrance may be had of any educational publisher. Among the good text-books in composition and rhetoric are those of Genung, Newcomer, Webster, Mead and Gordy, Scott and Denney, Lockwood and Emerson, Smith and Thomas, Herrick and Damon (revised edition), Gardiner and Kittredge and Arnold, Kavanagh and Beatty, Espenshade, Huntingdon, and Lamont. A convenient little reference-book on methods of teaching classics is Heydrick's *How to Study Literature*. The most complete treatise yet published on methods of teaching English subjects in general is Carpenter, Baker and Scott's *The Teaching of English*.

The paper edition of the *University Handbook on the Teaching of English*, which has for some years been sent free to applicants on payment of postage, is now exhausted. A few copies bound in cloth remain in the hands of the publishers, Scott, Foresman & Co., and will be sent postpaid for fifty cents each as long as they last.

The University theme and essay tablet for use in composition teaching, with any text-book or without a text-book, is published by O. P. Barnes, 378 Wabash avenue, Chicago, and is sold for fifteen cents.

New editions of classics and new texts and references in all

English subjects are constantly appearing, and the best way to choose is to select from publishers' catalogues those which appear to be most suitable, and to write for copies for examination with the privilege of return. All educational publishers extend this privilege to teachers and school officers.

**LATIN.** *Four units.*

Either three or four of the following units may be offered :

1. The Beginner's Book.
2. Four Books of Cæsar and Latin prose composition.
3. Six orations of Cicero and Latin prose composition.
4. Six books of Vergil's *Æneid* and Latin prose composition.

A full year must be given to each of these units. No credit is given for one or two units, unless the deficiency is made good after the student enters the University. If three units are offered, it is preferred that they be 1, 2 and 3; but 1, 2 and 4 will be accepted. No combination of Cicero and Vergil will be accepted as one unit.

**THE BEGINNER'S BOOK.** The all-important thing in the first year is that the pupil shall acquire a perfect knowledge of the forms of declension and conjugation. This means the ability not merely to repeat the paradigms correctly, easily, and rapidly, but to recognize instantly and certainly each case and verb form when met in isolation. Vocabulary and syntax are important, too, but they can be learned in later years, while a pupil who gets through the first year without learning the forms has little prospect of ever learning them. And no pupil who has to stop and think out or look up the identity of the forms he meets in his reading can ever read easily. There is only one way to teach this command of forms, namely, drill—drill at the first occurrence of a paradigm, drill in the regular reviews, drill at unexpected times all through the year. The teacher who cannot stand the drudgery of drills ought not to teach beginning Latin. Analysis into stems and endings may help some pupils a little, but it cannot take the place of thorough drilling. Besides the frequent repetition of paradigms, there must be many exercises in the recognition of isolated forms, given either orally or on the board. No beginner's book gives more of these exercises than are sufficient to serve as models.

In the first year the pronunciation is fixed, and it is as easy to fix a right one as a wrong one. The Roman method is of course the only one possible at present. A perfectly accurate pronunciation requires that long vowels be given twice the time given to short vowels, whether accented or not. This is contrary to English usage, and, for this reason, is so difficult that few teachers attempt it.

But it is very easy to distinguish in quality between long and short vowels, especially as most preparatory books indicate the quantities; and there can be no possible excuse for permitting incorrect accents. Requiring pupils to mark the long vowels in all written work is helpful, but will have no effect if they hear and use an incorrect pronunciation. The teacher should spare no pains in perfecting his own pronunciation; and he should always read to the class the Latin words in the next day's lesson, and make sure that every pupil knows the correct pronunciation of every word before he learns it.

A good feature of the book adopted for use in the high schools of this state is the connected passages of easy Latin scattered through the book as reading lessons. Under no circumstances should these be omitted. The transition from a beginner's book to Cæsar is difficult at best, and all the more so if the pupil has read no connected Latin in his first year.

CÆSAR. If the work of the first year has been done well, Cæsar is not too difficult an author to follow the beginner's book immediately. If Cæsar is read intelligently, he is very far from being too dull and monotonous for a year's work. Under these conditions, it is best to read, without substitution, four books of Cæsar, or selections from the entire seven books equivalent in amount to the first four. Books V-VII are more interesting than books I-IV, and the teacher who is weary of I-IV may well omit portions of them, especially I, 30-55, and substitute portions of the later books, as V, 1-24; V, 24-52; VI, 11-28; VII, 66-90. But if the teacher desires to make a partial substitution of some other author, the University will accept in place of one book of Cæsar an equivalent amount of Viri Romæ or Nepos. Any of the second-year books offer an acceptable substitute for Cæsar to schools which are not bound by the action of the Text-book Commission.

At the end of the second year the pupil should have an accurate working knowledge of all the common uses of the cases and modes. Therefore it is unavoidable that a drill on syntactical constructions should receive the chief attention during the reading of Cæsar. But if Latin prose composition is properly emphasized it will carry a large part of this burden, and will leave the class some time for getting at the contents of Cæsar's story. It is a great mistake to make nothing but a grammatical drill-book out of Cæsar.

The teacher will find it helpful to keep on his desk one of the several good editions of Cæsar.

CICERO. The six orations should include the four against Catiline and the one for the Manilian Law. The one for the Poet Archias

may be recommended as the sixth. If a partial substitution is desired, Sallust's Catiline may be read instead of the Manilian Law and the sixth oration. This gives variety in the year's work and makes the setting to the Catiline speeches more vivid.

The syntactical drill cannot yet be subordinated, but it ought not to require so much time as during the second year. Pupils should make written abstracts of the speeches, so that they may get the contents of each as a whole; should be encouraged to read the Latin aloud with rhetorical emphasis; and should in every possible way be led to appreciate the fact that they are reading great speeches, not disconnected pages of Latin sentences.

VERGIL. If the pupil has come up to the study of Vergil without a good working knowledge of declension and conjugation forms and of case and mode uses, he is to be pitied. There ought to be too much to do to permit of much grammatical drill. This is the reason why Vergil ought always to follow Cicero in the course, not precede. Opinions may differ as to whether pupils find Cicero or Vergil the more difficult, although a comparison of scholarly editions will prove that editors at least find Vergil vastly the more difficult. But while reading Cicero any teacher can find plenty of time for grammatical drill; while reading Vergil he ought not to be able to do so. And in his third year of Latin a pupil must have grammatical drill. If read in the fourth year, grammatical drill may be confined almost wholly to the period devoted to Latin prose composition.

First and foremost, the pupil should get the contents of the story. Fortunately few teachers fail to let their pupils do this in Vergil, however they may treat Cæsar and Cicero. Yet, an occasional college student will say that he does not know whether or not he has read the story of Æneas's descent to the lower world. Secondly, the pupil must learn to read Vergil metrically. This does not mean that he should be taught painfully to divide the lines into feet, giving a reason for each step, and then be left to imagine that he has thus "scanned" Vergil. He should be taught to read the lines as smoothly and intelligently as so much English poetry; and this is no difficult feat. Only then will he feel that Vergil wrote poetry. It is not necessary to learn all the rules of quantity laid down in the grammars. If he has been taught to discriminate between long and short vowels in his usual pronunciation he will have no trouble at all. If not, *Auxilia Vergiliana*, a little pamphlet published by Ginn & Co., shows how a few rules, well used, will carry him through almost all lines; and an occasional reference to the vocabulary will clear up the rest. If the teacher

is a convert in theory to the doctrines of Hale (as the writer is) or of Bennett, let him nevertheless begin by teaching the old-fashioned way, with an ictus on the first syllable of each foot, and no word accent. Few pupils will make music of Vergil's verse on any other plan. Thirdly, the pupils ought to learn a good deal of mythology—not theories about the origin and meanings of the gods, but the stories which form so integral a part of much of our English literature. In addition to these main topics, there are innumerable questions on matters literary and archæological which will occur to the teacher who knows the literature of his subject. Many of these will serve to interest and stimulate the pupil.

The teacher will find help in a desk copy of Knapp (Scott, Foresman & Co.) or Greenough and Kittridge (Ginn & Co.)

**LATIN PROSE COMPOSITION.** Although the goal in the study of Latin is the ability to read, rather than to write, the language, yet accurate reading is impossible without a good command of vocabulary, form, and syntax; and this can be acquired by no other method so surely and quickly as by the writing of Latin.

No manual of prose composition has been adopted by the Text-book Commission, and the teacher may therefore choose the one best adapted to his needs. There are two systems in vogue. Such books as Jones's Exercises in Latin Prose Composition (Scott, Foresman & Co.) and Bennett's Latin Composition (Allyn & Bacon) take up the principles of syntax in logical order, as they are given in the grammars, and give sentences which call for the practical use of these principles. Their chief purpose is to insure a systematic study and comprehension of the syntactical portion of the grammar. Such books as Daniell's New Latin Composition (Sanborn & Co.) and Moulton's Preparatory Latin Composition (Ginn & Co.) base their exercises closely on the texts of Cæsar and Cicero, so that the pupil uses the words and constructions found in the portion of the text just read. Their chief merits are that they give practice in writing connected passages as well as disconnected sentences, and they encourage the pupil to study closely the text he is reading. But these merits seem outweighed by the fact that they are necessarily less systematic in presenting the principles of syntax, although Daniell's attempts with some success to remedy this defect. If a specific recommendation is desired, our preference would be for the whole of Bennett, supplemented, if possible, by frequent exercises dictated from Daniell. This amount is not too large for the best interests of the pupil, since the more composition is emphasized the less needful it is to make mere grammatical drill-books of the Latin authors. D'Ooge's Latin Composi-

tion (Ginn & Co.) is a very successful attempt to combine the merits of the two methods.

The requirement of the University is that the equivalent of one period a week be given to composition throughout the second, third and fourth years. Individual experience must determine how this shall be divided. The most usual method, and perhaps the best, is to give it one period a week. Sometimes it is scattered out, so that a little is done every day; but this is likely to make the work too scrappy and to lead to its neglect. A few teachers spend several weeks together on composition alone, usually at the end of the year, and justify the plan on the ground that it interests the pupils more. This is no doubt true. The dislike felt by most pupils for composition is largely or wholly due to the fact that they do so little of it that it never becomes easy. But it must be remembered that composition is practiced as an aid to reading, and this aid is lost unless the reading is carried on side by side with the writing.

If such a book as Daniell's is used, the exercise assigned should always be the one based on the portion of the text just read by the class, even if some exercises have to be omitted. To let the writing lag far behind the reading defeats the purpose of the method.

**TRANSLATION.** If translation is done well it is a better training in English expression than can be obtained from original composition on the part of the pupil; for in original composition he can usually avoid expressing at all any idea which he cannot express easily, while in translation he is forced to give expression to every idea of his author. There is therefore a sad waste of opportunity if the teacher allows himself to be satisfied with slipshod, slovenly translation. Yet the mistake is prevalent, for "translation English" has become a synonym for a certain kind of language which is never heard outside of the classroom except for humorous effect. It consists in part merely of the overworking of some very good words and phrases. A modern general might sometimes urge or encourage his men: Cæsar always exhorted his. We sometimes cannot do things; the ancients were always unable to do them. A worse feature of "translation English" consists of so-called "literal translations" of Latin idioms. Some teachers even require such renderings, although monstrosities like "he said himself to be about to go" are not English at all, and therefore are not translations. A good classroom translation must be good English, and should at the same time show the disposition made of each word of the original. If one quality must be sacrificed let it be the latter, and let the teacher satisfy himself by questions that the

pupil understands the Latin. But the pupil cannot always make a good translation unaided, even if he understands the Latin. This is the best reason for invariably reading the review lessons. On the advance lesson he must be expected to stumble and must be helped. But on the next day he should be required to read through the lesson as smoothly and as perfectly as if he were reading so much English.

Too many teachers unconsciously have the habit of correcting translation by interjecting words and remarks while the pupil reads. If the pupil has prepared what he considers a good translation, this practice both irritates and discourages him. If he has not, it encourages him to prepare his translation in a slipshod way, trusting to hints from the teacher to carry him through. In either case, neither the pupil who recites nor the rest of the class can fit the teacher's suggestions into the pupil's translation. The pupil should always be allowed to read through, without suggestion, the portion assigned him, whether a sentence or a paragraph. The teacher should then comment on his mistakes, and finally should translate the whole properly.

**SUBJECT-MATTER.** A very common and very unfortunate defect in teaching is a failure to make sure that the pupil gets a good understanding of the subject-matter of the Latin authors. To take Cæsar, for example. Many pupils, many teachers even, find him dull and monotonous. No person could ever hold this opinion if he knew just what Cæsar did in each of his campaigns, and had taken the pains to study out his routes, his battle-fields, his methods, and his motives. But no history ever written would be interesting if read at the rate of half a page a day and studied solely from the point of view of his syntax. The language of Cæsar must be the main object of attention; but the pupil ought to know the story as he reads it, ought to appreciate the bearing of every new chapter on the whole, ought to trace out all the movements on the map. The failure to get such an understanding makes the author dull, makes it harder to secure an adequate translation of the passages assigned for the daily lessons, and leaves the pupil at the end of his year's work with no comprehension that he has been reading one of the world's great classics. If the average teacher feels satisfied that his pupils are getting such a knowledge of the subject-matter of the authors they are reading, he can easily test his results by an examination question. At the end of any book of Cæsar let him ask his class, without previous warning, to write out a narrative of the campaign. To judge by what most college stu-

dents remember of the contents of the preparatory authors, he will be surprised at the answers, if he gets any.

The surest and best method of giving pupils this knowledge of the subject-matter is requiring them to write out in note-books brief summaries of each day's lesson, as a part of the next day's work. This should be supplemented by brief discussions, and by questions during the daily recitations and in examinations. It goes without saying that the teacher himself must have a full comprehension of the subject-matter; and this he certainly will not have unless he makes a practice of reading at a sitting a whole campaign of Cæsar, a whole oration of Cicero, or a whole book of Vergil. He will be much helped, too, by reading one or more of the books which are mentioned later.

**SIGHT-READING.** Sight-reading has its value, though it has been overestimated. It is not worth doing at the expense of other things; but if there are a few minutes to spare at the end of the recitation, they may be well employed by letting the class read on into the next day's lesson without using either notes or vocabulary. This is better than taking Latin from some other source, because what is learned is fixed in the memory when the pupils read the passage again in preparation for the next day's recitation, and because it insures the attention of the whole class.

**BOOKS.** The following list contains a few of the books which, in our judgment, will be found most useful in the library of the high school or the teacher; the prices are quoted from the Publishers' Trade List Annual:

**CÆSAR.**

Holmes, Cæsar's Conquest of Gaul, Macmillan & Co., \$6.50. The best discussion of the military and geographical problems in Cæsar.

Fowler, Julius Cæsar, G. P. Putnam's Sons, \$1.50. Perhaps the best life of Cæsar.

Judson, Cæsar's Army, Ginn & Co., \$1.

**CICERO.**

Boissier, Cicero and his Friends, G. P. Putnam's Sons, \$1.75.

Forsyth, Life of Cicero, Charles Scribner's Sons, \$2.50.

**VERGIL.**

Conington, Vergil, Macmillan & Co., 3 vols., each \$3.25. The best English edition. Volume II contains Æneid I-VI.

Conington, Vergil's Poems in Prose, Longmans, Green & Co., \$2. Dryden, Translation, several editions.

Sellar, Vergil, Oxford Press, \$2.25. The best literary criticism.

Glover, Studies in Virgil, Edward Arnold, \$2.25. Most helpful and suggestive.

## GRAMMARS.

The teacher should have all the grammars commonly referred to, and especially Harkness' Complete Latin Grammar (1898), as a corrective to the 1881 edition adopted for use in the state.

## LEXICONS.

Harpers' Latin Dictionary, American Book Company, \$6.50.  
 Lewis, Elementary Latin Dictionary, American Book Company, \$2.  
 White, English-Latin Dictionary, Ginn & Co., \$1.50.

## DICTIONARIES OF ANTIQUITIES.

Harpers' Dictionary of Classical Literature and Antiquities, American Book Company, \$6 to \$10.

Seyffert, Dictionary of Classical Antiquities, Macmillan & Co., \$2.25.

One or the other of these books is almost indispensable.

## ATLASES.

Ginn's Classical Atlas, Ginn & Co., \$1.25 to \$2.  
 Kiepert, Atlas Antiquus, Sanborn & Co., \$2.50.  
 Sanborn's Classical Atlas, Sanborn & Co., \$1 to \$1.75.

## WALL MAPS.

Kiepert, get price-list from Rand, McNally & Co. The best and most expensive. Cheaper maps are advertised by the Boston School Supply Company, but the department has not examined them.

## HISTORY.

(See the department of history.)

## HISTORIES OF LITERATURE.

Cruttwell, History of Roman Literature, Charles Scribner's Sons, \$2.50.

Mackail, Latin Literature, Charles Scribner's Sons, \$1.25. This is itself a work of literature.

## MYTHOLOGY.

Gayley, Classic Myths in English Literature, Ginn & Co., \$1.50.  
 Guerber, Myths of Greece and Rome, American Book Company, \$1.50.

## MISCELLANEOUS.

Bennett and Bristol, The Teaching of Latin and Greek, Longmans, Green & Co., \$1.50.

Hale, Art of Reading Latin, Ginn & Co., 25 cents.

Johnston, *Private Life of the Romans*, Scott, Foresman & Co., \$1.50.

Johnston, *Teaching of Second-year Latin*, Scott, Foresman & Co., free.

GREEK. *Three units.*

1. Elementary Greek. Gleason's Greek Primer or White's First Greek Book, or an equivalent. Thorough mastery of declensions and conjugations, and the main ideas of syntax. Xenophon's *Anabasis* begun, and twenty to thirty pages read. Goodwin's, Babbitt's or Goodell's Greek Grammar.

2. Xenophon's *Anabasis* continued into or through the fourth book, or an equivalent amount of other Attic prose. Review of inflections. Systematic study of syntax in the grammar. Practice in writing Greek based on the text read. Constant training in sight-reading.

3. Homer's *Iliad* or *Odyssey*, five to six books, exclusive of the Catalogue of Ships. Special attention to Homeric forms, vocabulary, and scansion. Constant practice in reading at sight. Seymour's School *Iliad* or Benner's *Selections from Homer's Iliad*. Perrin & Seymour's School *Odyssey* (edition with eight books). Attic prose composition once a week. Bonner's Greek Composition for schools.

SUGGESTIONS TO TEACHERS.

Special attention should be paid to the regular forms and constructions, the most common words and phrases and principles, leaving the irregular or uncommon to be learned when they occur in reading. Require a firm grasp of the essentials. Review and repeat, but not to weariness. Go slowly at first, yet aim to get results as fast as possible.

Help students to acquire a vocabulary, by grouping words when possible, by bringing out the English derivatives, by having them mark in both text and grammar words or principles especially to be learned, and then review them often. Don't allow a student to turn to his lexicon or grammar to look up a word or principle until he is sure that it is necessary. Have him, if possible, originate some device of his own to remember the meanings of words.

Go over as much as possible of the advance lesson each day. Have students pronounce and translate at sight; watch and teach or guide them how to read, leading them to bring forth and apply meanings of words and forms and principles of syntax they have already had and know. Explain as much as necessary, but leave something for them to do.

Have students translate the words of a sentence in the order in

which they stand in the original, and make good English afterwards. In reading poetry let them use a poetic order.

Use the blackboard much; let the students see what is necessary.

Yet train the ear also. Have some oral work every day. Have students pronounce aloud, and let them translate some from hearing, especially passages already translated from the book. If possible, introduce some conversational exercises, and have students learn some Greek by heart.

Require a knowledge of the geography, history and mythology needed to understand the author being read, and something of his life, time and works.

A few books that ought to be at command of students and teachers:

Lord's Classical Atlas, Boston, Sanborn, \$1 to \$1.75.

Botsford's History of Greece, New York, Macmillan, \$1.10.

Bury's History of Greece, New York, Macmillan, \$1.90.

Pennell's Ancient Greece, Boston, Allyn & Bacon, 60 cents.

Butler's Story of Athens, New York, Century Company, \$2.40.

Jebb's Primer of Greek Literature, New York, Appleton, 40 cents.

Capp's Homer to Theocritus (a history of Greek literature), New York, Scribners, \$1.50.

Jebb's Homer, an Introduction to the Iliad and Odyssey, Boston, Ginn, \$1.12.

Goodell's The Greek in English, New York, Holt, 60 cents.

Gulick's Life of the Ancient Greeks, New York, Appleton, \$1.40.

Harpers' Dictionary of Classical Literature and Antiquities, New York, Harpers, \$6 to \$10.

Liddell & Scott's Greek Lexicon, New York, American Book Company, \$10.

Hill's Illustrations to School Classics, New York, Macmillan, \$2.50.

Tarbell's History of Greek Art, New York, Macmillan, \$1.

Schuchhardt's Schliemann's Excavations, New York, Macmillan, \$4.

Tsoudas and Manatt's Mycenæan Age, New York, Houghton, Mifflin & Co., \$6.

Mycenæan Troy, Tolman and Scoggin, New York, American Book Company, \$1.

Weissenborn's Homeric Life, New York, American Book Company, \$1.

Leaf and Bayfield's Iliad with notes, New York, Macmillan, 2 vols., each \$1.40.

Moss's First Greek Reader, new edition, Boston, Allyn & Bacon, 70 cents.

Dickinson's Greek View of Life, London, Methuen, \$1.

# GERMAN. *A three years' course.*

## FIRST YEAR.

TEXT-BOOKS SUGGESTED.\* Carruth's Otis's German Grammar, Henry Holt & Co., New York (supplemented if desired by further exercises in Becker's Elements of German, Scott, Foresman & Co., Chicago), and Carruth's German Reader, Ginn & Co., Boston.

OBJECTS OF FIRST YEAR'S WORK. (1) To obtain a thorough knowledge of elementary grammar with practical application to the printed and spoken language; (2) to obtain a good German pronunciation and ability to use German script with accuracy and moderate ease; (3) to acquire familiarity with a limited German vocabulary as employed both in standard German prose and in ordinary conversation; (4) to begin an acquaintance with good German literature and with German popular songs; (5) to learn to carry on conversation in very simple German on every-day topics.

DISTRIBUTION OF THE WORK. There should be a German recitation every school-day of the thirty-four working weeks of the school year. These 170 recitation periods may wisely be distributed as follows:

Introductory (talk about the language, illustrations, introducing phrases for conducting recitation in German, pronunciation, etc., lesson I of the grammar) . .	5	periods.
Grammar (twenty-four lessons, two periods to each) . .	48	"
Review of grammar . . . . .	18	"
Reader (sixty pages, from one half page daily to two pages daily, including review) . . . . .	44	"
Exercises (in reader or in state text, or both, including reviews) . . . . .	28	"
Dictations and learning songs . . . . .	22	"
Final review . . . . .	5	"
Total . . . . .	170	periods.

\*The books recently adopted by the School Text-book Commission serve only for a part of the first two years. Unfortunately the law was not drawn with a view to two- and three-year courses, and accordingly the Commission has adopted a book of exercises but no reader. Practically, every teacher of German uses a grammar and a reader in the first year. Accordingly, the course here recommended introduces the state text in grammar, makes a place for the exercise book for those who use such in addition, and outlines the work in a reader. The detailed programs of work are given only for the benefit of new teachers, though they may be found helpful to all. Of course, experienced teachers will adapt any such plan to the needs of individuals and classes. In any case, it is wise to explain in advance to the class the purpose of the work, the method to be pursued, and the general distribution of it.

## PROGRAM OF THE WORK—FIRST TERM.

First week: Introduction (lesson I) . . . . .	5 periods.
Second week to fifth, inclusive: Grammar, seven lessons (including VIII), fourteen recitations, with six more for review . . . . .	20 “
Sixth week to seventeenth, inclusive: Grammar, three periods weekly first six weeks, two periods weekly last six weeks, to lesson XVIII, inclusive; twenty periods first time, ten on review. . . . .	30 “
Reader, two periods weekly for twelve weeks, divided between reading and exercises on the reading, cover- ing fifteen pages of Carruth's Reader . . . . .	24 “
Dictations, one weekly, last six weeks. . . . .	6 “
Total. . . . .	85 periods.

CONDUCT OF LESSON II IN CARRUTH'S OTIS'S GRAMMAR. First recitation (after a week of introductory drill in pronunciation). Assign to the German exercise II, and in assigning read over slowly and carefully the model sentence, §2, and the words of the vocabulary. (This practice of reading the vocabulary should be kept up for the first eight lessons.) Admonish class to read the German sentences over aloud in studying them.

*Recitation.*—Require the recitation of the model sentence from memory; be sure that the pupils understand the cases and their uses. Call for the statement of the grammatical facts included in the text of the lesson. Have the class recite the definite article, singly and in concert; have the declension given both downward and across; that is, by genders and by cases.

NOTE.—In connected speech the *e* of the article is slurred (see page 6 of the grammar), but in recitation of the forms the *e* should be pronounced distinctly, long before *m* and *n*, short before *r* and *s*.

The vocabulary may be read, or the German words required on giving the English; or, in case of the nouns, the pupils may be required to give the correct article with the noun when the teacher has spoken the noun alone. The class should recite the present tense of *sein* singly and in concert.

SECOND RECITATION ON LESSON II. Assign German exercise II and the writing, in German script, of one-half of exercise 2, the preparation of continuations of the specimen sentences in conversation 1, the memorizing of the *Sprichwort* and the poem *Das Glueck*. In assigning the lesson these should be pronounced by the teacher. Also a review of the forms of the definite article and present tense of *sein*.

*Recitation.*—Have sentences of the German exercise read by pupils in turn. The pupils may turn them into English, or simply be asked about the forms of the articles used, or both. In the first

lesson, constant attention must be paid to pronunciation in reading the German sentences. It is a good exercise to read the German sentences slowly and have the pupils repeat them after the teacher. It cultivates the ear and promotes attention. Then send pupils to board to copy from their papers the sentences of exercise 2. When all are written, go over the sentences on the board and correct, asking class to suggest corrections and explaining, and requiring pupils to make corrections accordingly on their own papers. At close of recitation the teacher should take up these papers and correct them carefully, to return at the next recitation.

NOTE.—The teacher should take up and correct the papers himself for at least the first eight lessons. After that the class may be trusted to make its corrections in the class, but the papers should be taken up once a week throughout the first year.

Recite again, and have some of the pupils write on board, the definite article and the present tense of *sein*. Use conversation 1, the teacher asking the questions and requiring the pupils to reply, using the entire vocabulary to the conversation. Have the *Sprichwort* and the poem recited in concert.

LESSON III. Assign second half of English exercise 2 in lesson II, and to the German exercise of lesson III, for one recitation. In this recitation the first half of the English exercise 2 of lesson II is given back corrected.

The second recitation on lesson III will be assigned as on the second half of lesson II, that is, German exercise III and first half of English exercise 3, but in addition the pupils have been required to learn the now corrected sentences of the first half of the English exercise 2, and recite them in response to the reading of the English by the teacher. In learning these sentences the pupils should copy them as corrected into a permanent exercise book. The learning and memorizing of the corrected sentences is one of the most essential features of the lesson. Thus, in every recitation there will come the correction of one-half of an English-German exercise and the recitation of one-half of the one preceding. It is important that the principles, vocabulary and paradigms of each lesson should be thoroughly learned before translating the English exercise. The translation of the English sentences should always be made a means and never an end in the study of the lesson.

The most dispensable part of the recitation is the reciting of the words of the vocabulary. When a German song is to be learned and sung, as in lessons III, VII, and IX, the memorizing may be done along with the second half of that lesson and the singing in the first part of the next recitation. The favorite songs should be sung frequently. There is no better means of rousing

love for the language and fixing the vocabulary in the pupil's memory. Or the singing of the songs may take part of the period assigned to dictations.

**FIRST READING LESSON.** For the first reading lesson assign fourteen lines in Carruth's Reader. Read it over in German in assigning it. In recitation, have the pupil read the German sentence through first; correct him, and have him read it again before translating. Translation should always be in good idiomatic English, and as nearly literal as this will permit. Do not permit a word-for-word translation except as necessary to explain a German idiom. By all means require translation. Reading without translation should not be encouraged the first year, unless it be with extra matter. Discourage marginal and interlinear notes.

*Exercises.*—The exercises connected with the reader may be taken up one at a time just after the reading of the corresponding section, or all those on a given extract may be taken in connected series, or they may be postponed until the completion of the work in the reader. Whether the exercises are taken from the reader or from Becker's Elements of German, they should be written and corrected and learned as prescribed for the exercises of the grammar. In the second term, however, the class may be occasionally tested for its ability to do an exercise orally without having written it previously. But, even then, the exercises should be written out afterwards. Writing makes an exact scholar. Neatness in writing should be insisted upon. Exercises should have wide spacing and ample margins, to make room for corrections.

*Dictations.*—Dictations should consist of very simple German. A sentence should be read through twice, once very slowly and then at normal rate, and the pupil should be expected to fix the sentence as thus read. If the sentence is complex, the teacher will have to repeat the clauses in order. Dictations should be handed in for inspection and correction. Occasionally the pupils should be required to read aloud from their own manuscripts.

DISTRIBUTION OF THE WORK—SECOND TERM, FIRST YEAR.

Grammar (six lessons of Carruth's Otis, XIX to XXIV, inclusive, including review).....	16	periods.
Reader (forty-eight to sixty pages, through <i>Der zerbrochene Krug</i> in Carruth's Reader).....	32	"
Exercises (completing XXXVI in Carruth's Reader) ..	16	"
Dictations and songs .....	16	"
Review.....	5	"
Total.....	85	periods.

PROGRAM OF THE WORK—SECOND TERM, FIRST YEAR.

Reader, two periods weekly, sixteen weeks.....	32	periods.
Grammar, one period weekly, sixteen weeks .....	16	"
Exercises, one period weekly, sixteen weeks.....	16	"
Dictations and songs, one period weekly, sixteen weeks, .....	16	"
Review, one week solid.....	5	"
Total.....	85	periods.

SECOND YEAR.

TEXTS. Carruth's Otis's Grammar; Carruth's Reader; Wilhelm Tell, Carruth's edition, Macmillan & Co., New York, or Palmer's edition, Holt & Co., New York, or Deering's edition, Heath & Co., Boston; for sight-reading: Hauff's *Der Zwerg Nase* (38 pp.), C. H. Kilborn, Boston, Ebner-Eschenbach's *Krambambuli* (47 pp.), American Book Company, Chicago, or Heyse's *Die Blinden* (52 pp.), Holt & Co., New York.

WORK TO BE ACCOMPLISHED. Review and completion of grammar; reading about 225 pages, with some composition exercises; practice in sight-reading.

DISTRIBUTION OF THE WORK—SECOND YEAR.

Review of grammar (lessons II to XXIV) .....	16	periods.
Completing grammar (lessons XXV to XXX).....	16	"
Completing reader, forty-five pages of prose and fifteen pages of verse, selected.....	32	"
Composition exercises on the same.....	16	"
Wilhelm Tell, complete, with review.....	64	"
Sight-reading.....	16	"
Final review.....	10	"
Total.....	170	periods.

PROGRAM OF THE WORK—FIRST TERM, SECOND YEAR.

Completion of grammar, one period weekly for sixteen weeks.....	16	periods.
Completion of reader, three periods weekly for eleven weeks, continuing with Wilhelm Tell, act I, five weeks.....	48	"
Composition exercises on reader, etc., one period weekly for sixteen weeks.....	16	"
General review, one week solid.....	5	"
Total.....	85	periods.

PROGRAM OF THE WORK—SECOND TERM, SECOND YEAR.

Review of grammar, one period weekly, sixteen weeks..	16	periods.
Completion of Wilhelm Tell, three periods weekly for sixteen weeks.....	48	"
Sight-reading, one period weekly for sixteen weeks....	16	"
General review, one week solid.....	5	"
Total.....	85	periods.

NOTE.—The Committee of Twelve recommends Wilhelm Tell for the intermediate course, or third year, of high-school work. For schools having a three-year

course it may be well to follow this recommendation and occupy the reading time of the second year with easy prose, like that found in the reader. But high schools having only two years of German should by all means not deprive their pupils of the delight of reading this play, which invariably appeals to them.

### THIRD YEAR.

TEXTS. Freytag's *Die Journalisten*, ed. Thomas, Holt & Co., ed. Toy, Heath & Co. (about 135 pages); Fouque's *Undine*, ed. v. Jagemann, Holt & Co. (about 115 pages); Heine's *Reisebilder*, ed. Van Dael, Heath & Co., ed. Burnett, Holt & Co., ed. Gregor, Ginn & Co. (about 90 pages); Riehl's *Burg Neideck*, ed. Wilson, Ginn & Co. (57 pages); Rosegger's *Waldschulmeister*, ed. Fossler, Holt & Co. (about 125 pages); Heyse's *Die Blinden*, ed. Carruth and Engel, Holt & Co. (about 50 pages); Schiller's *Balladen*, ed. Johnson, Heath & Co. (about 90 pages). Out of these a good selection would be: Freytag's *Die Journalisten*, Schiller's *Balladen*, and any one of the other books listed. If one of the longer ones, a portion may be read at sight.

WORK TO BE ACCOMPLISHED. Reading and careful translation of about 300 pages of prose and verse, with composition and conversation exercises thereon, and drill in more difficult features of grammar as illustrated by the text.

DISTRIBUTION OF THE WORK. A class should read from two to three pages daily, the lesser amount when more time is given to exercises on the text and to grammar review. Exceptional classes may be able to read 400 pages in the third year. In view of the minuteness with which programs for the earlier years have been given, it seems unnecessary to make such programs for the third year.

### FRENCH. *One, two or three units.*

FIRST UNIT. The elements of grammar (Fraser and Squair's French Grammar), all of part I and the irregular verbs in part II; or Grandgent's Essentials of French Grammar, through the irregular verbs, or Aldrich & Foster's Elementary French.

Great stress should be laid on pronunciation, the quality of the vowels, syllabication. To fix these principles and connect sound with spelling, brief exercises in dictation, occupying only five or ten minutes, should be introduced after the first few weeks.

As the grammars named above all offer reading material, the reader proper need not be introduced before the seventh or eighth week, at first but one or two lessons a week, then with increasing frequency as the elementary facts of the language are mastered.

This reading should cover not less than 100 pages of simple French (as in Super's Reader), and should serve a threefold purpose: Trans-

lation into good English, practice in reading aloud of French, and illustration (and hence review) of the grammatical principles set out in the rules and applied in the written exercises.

SECOND UNIT. Completion of all the lessons in the above-mentioned grammars, with suitable written exercises at least once a week. In this manner the pupil will by the end of this period have mastered all the essentials of accidence and syntax. The reading should contribute to this end; in particular, the use of modes and tenses should be repeatedly dwelt upon in connection with the reading.

More emphasis is now to be placed on dictation, and on the speaking by teacher and pupils of simple French sentences based on their reading, the teacher sometimes also reading aloud in French for translation by the pupils. The reading should comprise from 300 to 350 pages, which may be taken from the latter part of the reader and from such texts as Malot's *Sans Famille*, Daudet's *Selected Stories*, Erckmann-Chatrian's *Madame Therese*, Labiche's *le Voyage de M. Perrichon*, Sandeau's *Mademoiselle de la Seigliere*.

THIRD UNIT. Thorough review of grammar. Composition once a week, both formal grammar exercises and résumés and paraphrases of short portions of French stories.

Suitable composition books are: Bouvet's French Syntax and Composition, and François's Advanced French Prose Composition.

Reading of 600 pages in such works as Mérimée's *Colomba*; A. France's *le Crime de Sylvestre Bonnard*; Pouvillon's *Petites Ames*; George Sand's *la Mare au diable*; Pailleron's *le Monde ou l'on s'ennuie*; Loti's *Pêcheur d'Islande*; Theuriet's *Bigarreau*; Coppée's *le Pater*.

Teachers of French are advised to consult the valuable Report of the Committee of Twelve of the Modern Language Association of America.

### PHYSICS. *One unit.*

Physics as a subject for high-school instruction has a double advantage in that it is both mathematical and experimental. In so far as it is mathematical it furnishes a concrete field for the application of the generalizations of algebra and geometry, and consequently shares with these subjects their certainty and their freedom from human bias. As an experimental science it has a great advantage in the fact that the observations made in the experiments must be vitalized with thought in order to be effective. There is in physics no mere staring at phenomena with whose appearance the observer has nothing to do, but on the contrary the

things to be observed are produced by the student himself through the experiments he makes. Should the first observation not be conclusive, the experiment may be repeated until the student is satisfied that he has not only seen but understood. This form of observation offers an exceptionally fine field for self-activity of an educative nature—a field which is continually broadened by the ever-increasing laboratory facilities that are being provided in public and private high schools.

While successful teaching of physics requires both text-book and laboratory work, the latter is the more important and at the same time is more often neglected. The laboratory work and text-book work must each supplement the other. Without the actual performing of experiments the text-book is almost meaningless and soon forgotten.

In handling any text the teacher should feel free to omit any parts which, with the laboratory facilities at hand, cannot be made perfectly clear. In every good text are found sets of problems. If these are sufficiently simple, they are of great use in affording an opportunity to apply and therefore fix in mind the principles learned. When the problems prove difficult it is likely not on account of any deficiency in the student's mathematical training. The terms used—ergs, dynes, kilograms, etc.—are confusingly new. The thing to do is to supply exceedingly simple problems till the student becomes familiar with the new units.

The second essential of a course in physics, the experimental part, includes, first, a set of thirty to forty experiments to be performed by the student; and second, a number of demonstrative experiments to be performed by the teacher in connection with the lecture or recitation. Just which experiments should be performed by the students and which should be left for classroom demonstration is often a hard question to decide. The rule that demonstrative experiments be qualitative and students' experiments quantitative is good, but has many exceptions.

Probably the most difficult task that confronts the physics teacher in the small high school is to start the equipment of a laboratory on small means. The first maxim is, buy for use and not for show. Buy the less expensive first. Get the necessities before the luxuries. Do not begin by the purchase of Geisler tubes and X-ray apparatus.

In offering suggestions in regard to the equipment of a laboratory, let us begin with the room itself. This should be dry, well lighted, and, if possible, with south exposure.

The room should be provided with heavy, flat-topped tables, about thirty-two inches high. The length and breadth of these

must often be adapted to the shape of the room, but, when possible, tables three feet wide and eight feet long will be found very convenient. These tables should have no iron in their construction, and the top should project at least three inches. Any good carpenter can make these tables.

If there is a good water system in the building the laboratory should be provided with a sink. If not, a wooden tank a foot deep, two feet wide, and three feet long, lined with zinc or galvanized iron, will be found convenient. If the laboratory can be supplied with gas, the fixtures should hang from the ceiling directly over the tables and about four feet above them. Connections can then be made with Bunsen burners by the use of rubber tubing. If no gas can be provided, gasoline torches handled with care are the best substitute.

Cases for storing apparatus should be about fourteen inches deep, with movable shelves and glass fronts. They should be self-locking, and all open with the same key. A class in physics consumes at best more of the teacher's time than one in most other branches. Everything about the laboratory should be arranged to facilitate the getting out and putting away of apparatus. Then the teacher should be expected and required to see that all tools and apparatus be locked up when not in use.

A few tools for making and repairing apparatus are an essential part of a laboratory equipment. There should be a small carpenter's work-bench, and at least the following tools: Vise, fine-toothed saw, small plane, brace, drills, screw-driver, pliers, files, small claw-hammer, tinner's snips, small soldering-iron, hack-saw.

The following valuable advice for laboratory management is taken from Chute's Laboratory Manual:

"There are in use two methods of conducting laboratory work, the *separate* system and the *collective* system. Under the former the students work on different problems, the apparatus going around in rotation. It is difficult under this plan to have the students' work conform to a strictly logical order, but on the other hand it requires little or no duplication of apparatus. The collective system is the ideal one. Under it all are engaged on the same kind of work at the same time. It has this advantage over the separate system, a teacher can instruct all at once on any point demanding more than ordinary care and can give more attention to the few who may be less apt in their work. A combination of the two is probably the best for most schools, in that it avoids the duplication of expensive pieces of apparatus and permits it in the case of the less costly."

Experience has taught us that the average teacher of physics is liable to err in requiring too many experiments of his pupils. The

result of such an error is not only confusing, but it permits the pupil to form careless habits in the use of apparatus; and, what is worse, leads him into the dangerous habit of being satisfied with inaccurate results. It would be far better for the teacher to select half the number of experiments, and see to it that each individual member of the class performs each experiment individually, and preserves a description of his work and its results in good readable form.

In submitting the following list of thirty experiments we have endeavored to suggest the most important problems which should be used in an elementary course in physics. Where facilities are ample and the time is longer than usual in the average school, it may be well to increase this number; unless such conditions exist, however, it would in all probability be unwise to undertake more than is expected in this outline. Any student who, with proper direction, has performed the following thirty experiments in connection with the text-book work, and who has preserved the history of each experiment in note-book form, will have accomplished all that should be expected of the average high-school student in the period of one year, and credit will be given for same at the University.

Each experiment is suggested by number, and following is given the apparatus necessary to perform it. The teacher is expected to use his own judgment in substituting other experiments when laboratory equipment or other facilities would make such change advantageous to the students.

#### LIST OF EXPERIMENTS.

##### MECHANICS.

- I. Exercises in measurements.
  - Meter stick or metric ruler.
  - School square.
  - Circular disc.
- II. Weight of unit volume.
  - Any solid of regular geometric form.
  - Metric ruler.
  - Balances (spring balance will do).
- III. Law of elasticity.
  - Wooden rod a half inch square and about forty inches long.
  - Two blocks to support the ends.
  - Set of weights.
  - Coiled spring and support.
  - Metric ruler.

IV. Parallelogram of forces.

Three spring balances.

Parallelogram board or three quilting-frame clamps  
to attach balances to table.

Some thread.

Large sheet of paper.

V. Principle of moments (the lever).

Meter stick.

One lever holder.

Set of weights.

Thread.

VI. Inclined plane.

Board six inches wide and forty inches long.

Tripod support, clamp holder and short piece of rod  
(to support upper end of board).

Hall's carriage.

Balances (spring balance will do).

VII. Volume and pressure of a gas (Boyle's law).

Any Boyle's law apparatus.

VIII. Archimedes's principle.

Any solid that will sink in water and whose volume  
can be measured.

Balances (spring balances will do).

Vessel of water.

IX. Specific gravity of a solid.

Any solid (a small stone will do).

Balances (spring balance will do).

Vessel of water.

X. Specific gravity of a liquid.

Small bottle, two to eight ounces.

Balances (spring balance will do).

Liquid to be measured.

HEAT.

XI. Linear expansion of a solid.

Linear expansion apparatus.

Thermometer.

Boiler (apparatus A).

Bunsen burner (or gasoline torch).

Funnel.

Rubber tubing for connections.

## XII. Cubical expansion of air.

Bunsen burner (or gasoline torch).

Small glass tube twenty centimeters long, sealed at one end and a drop of mercury near the other end, so as to inclose a column of dry air about fifteen centimeters long.

Boiler (apparatus A).

Jar of ice-water.

Thermometer.

Metric ruler.

## XIII. Specific heat.

Vessel of boiling water.

Lead shot (or closely wound coil of wire).

Boiler (apparatus A) and dipper.

Thermometer.

Calorimeter (after Hall and Bergen).

Bunsen burner (or gasoline torch).

## XIV. Heat of fusion of ice.

Cracked ice (or snow).

Calorimeter.

Balances (better use beam balance).

Thermometer.

## XV. Heat of vaporization of water.

Calorimeter.

Beam balances.

Boiler.

Glass trap.

Thermometer.

Rubber connections.

## MAGNETISM AND ELECTRICITY.

## XVI. Lines of force about a bar magnet.

Six-inch bar magnet.

Iron filings.

Compass ten millimeters in diameter.

Pepper-box or wide-mouthed bottle covered with cheese-cloth, to sift filings.

## XVII. Simple voltaic cell.

Student's demonstration battery.

Mercury.

Galvanometer.

## XVIII. Polarization of battery cell.

Student's demonstration battery.

Porous cup for above.

Solution of copper sulphate and solution of zinc sulphate.

Galvanometer.

Commutator.

Leclanché battery cell.

## XIX. Magnetic effect of current.

Battery cell.

Copper wire.

Compass.

Commutator.

## XX. Electromotive force of batteries.

Two similar battery cells.

Galvanometer.

High-resistance coil (about 1000 ohms).

Commutator.

## XXI. Resistance by substitution.

Daniell cell (made of student's demonstration battery).

Coil of unknown resistance.

Commutator.

Resistance-box (or some German silver wire, about No. 20. A foot in length of this wire may be used as a unit resistance).

## XXII. Resistance by the Wheatstone bridge.

Wheatstone bridge.

Unknown resistance.

Resistance box (or German silver wire).

D'Arsonval galvanometer.

Commutator.

Battery cell (battery two or three).

## XXIII. Currents by induction.

Bar magnet.

Horseshoe magnet.

Two circular coils, each containing 600 to 700 turns of No. 27 magnet wire.

Iron rod to insert in coils (rod from tripod will do).

D'Arsonval galvanometer.

Battery of one or two cells.

Commutator.

## SOUND.

## XXIV. Velocity of sound in air.

Seconds pendulum.

Hammer and any sonorous body.

## XXV. Wave-length of sound.

Tuning-fork of unknown rate.

Glass tube  $1\frac{1}{2}$  inches in diameter and 30 to 50 inches long.

One-holed rubber stopper to fit glass tube.

Short piece glass tubing to insert in rubber stopper for attachment of rubber tubing.

From three to four feet rubber tubing.

Funnel.

Water.

## XXVI. Vibration rate of tuning-fork.

Vibrograph and tuning-fork to fit.

String.

## LIGHT.

## XXVII. Images in plane mirror.

Mirror  $1\frac{1}{2} \times 4$  inches.

Rectangular block to support mirror.

String or rubber band.

Pins.

Ruler.

## XXVIII. Index of refraction of glass.

Rectangular piece of plate-glass with opposite edges ground.

Pins.

Ruler.

## XXIX. Focal length of lens.

Lens.

Ruler.

Lens holder.

Card holder.

White cardboard.

## XXX. Size of object and image.

Wire gauze (or piece of fly-screen).

Lens.

Meter stick.

Ruler.

Candle or lamp.

Lens holder.

Card holder.

## LIST OF APPARATUS.

The following list of apparatus is suggested as one best suited to the small or medium-sized high schools. It contains all pieces necessary to perform the thirty experiments listed above, and will not be so expensive that the smaller schools cannot afford to purchase. The second column designates the number of pieces that should be purchased, based upon the size of the class. If only one piece of each is bought the expense will be much less, but more time will be needed for laboratory work, since only three or four pupils can use one set of apparatus at the same time. A class of twelve should require at least three sets of apparatus. It is understood of course that this does not apply to the larger and more expensive pieces.

APPARATUS.	Pieces needed.	Cat. No., C. H. Stoelt- ing & Co., Chicago.	Cat. No., Central Scientific Company, Chicago.	Cat. No., Wm. Gaertner & Co., Chicago.
Meter stick.....	One for 2.....	74	321	H 101
Brass disc.....	One for 6.....			H 102
School square.....	One for 2.....	137	521	
Aluminum cylinder.....	One for 4.....	964		H 701
Wooden rod.....	One for 2.....	551	651a	
Spring and weight holder.....	One for 6.....			H 1202
Set weights.....	One for 4.....			H 203
Metric ruler, 30 cm. long.....	One each.....	82	325	
Spring balances.....	One for 2.....	311	3867	H 401
Beam balance.....	One for 12.....		3816	H 202
Parallelogram board.....	One for 6.....			H 402
Knife edge support (lever holder).....	One for 4.....	691	730	H 1501
Hall's carriage.....	One for 6.....	685	771	H 1602
Boyle's law tube.....	One for 6.....	1161	1051	* H 1001 † H 1001a
Mercury.....	2 lbs.....			
Jar, any good vessel holding a qt.....	One for 4.....			
Paraffin.....	2 lbs.....			
Bottles, 2-oz., any kind.....	One for 4.....			
Linear expansion app.....	One for 6.....	1445	1561	H 1402
Steam-boiler and generator.....	One for 6.....	1329	1501	H 1401
Bunsen burner, gasoline torch, or large alcohol lamp.....	One for 2 to 4.....	5205	4625	
Rubber tubing (estimated am't).....	20 feet or more.....			
Thermometer.....	One for 2.....	1255	1525	H 1102
Calorimeter.....	One for 2.....	1335	1589	H 1801
Glass trap.....	One for 12.....	1333		
Volume coeff. of air-tube.....	One for 4.....	1359		* H 1302 † H 1302a
Bar magnet.....	One for 4.....	1802	1705	H 2502
Compass, small.....	One for 4.....	1881	1761	H 2902
Compass, good.....	One for 4.....	1891	1765	H 2601
Galvanometer frame.....	One for 4.....			H 2801
Iron filings.....	2 lbs.....			
Demonstration cell.....	One for 4.....	2300	2110	H 2802
Porous cup.....	One for 4.....	2301	2110a	H 2803
Carbon, lead, iron, aluminum electrodes.....	One for 4.....	2306 2309	2110d-z	H 3102
Copper sulfate.....	5 lbs.....			
Zinc sulfate.....	3 lbs.....			
Telegraph-key.....	Two for class.....	2688	2335	

APPARATUS.	Pieces needed.	Cat. No., C. H. Stoelt- ing & Co., Chicago.	Cat. No., Central Scientific Company, Chicago.	Cat. No., Wm. Gaertner & Co., Chicago.
Telegraph sounder.....	Two for class...	2690	2339	.....
Telegraph relay.....	Two for class...	2692	2343	.....
Battery call telephone.....	Two for class...	2703	2365	.....
Electric call-bell.....	One for class...	3000	2692	.....
Push-button.....	One for 4.....	3081	2756	.....
Pair coils for induction experi- ment.....	Pair for 6.....			H 3601
Battery motor.....	Two for class...	{ 2717 2715	{ 2246 2245 }	H 3703
Horseshoe magnet.....	One for 6.....			H 2503
Hydrometer for light liquids.....	One for class...			H 803
Vibrograph.....	One for class...	1745	3035	H 3901
Tuning-fork for vibrograph.....	One for class...	1699	3037	.....
Tuning-fork, 256.....	One for 4.....	1693	3012	H 4001
Glass tube, 1½ x 40.....	One for 4.....	5632	4982	.....
Rubber stoppers to fit tube, one- hole.....	One for 4.....	{ 5800 No. 9	{ 5213 No. 9 }	H 501
Sulfuric acid.....	1 lb.....	Cat. A	Cat. M	Cat. H
Commutator.....	One for 6.....	2979	2601	H 2901
Leclanche cells.....	One for 4.....	2389	2115	.....
Magnet wire D C C.....		6958	6107	.....
Magnet wire, 1 lb. No. 24.....		Specify size	Specify size	.....
Ammonium chlorid.....	1 lb.....			.....
Thousand-ohm coil.....	One for 4.....			H 3101
Resistance-box.....	One for 6.....	2941	2442	.....
Unknown resistance-coil German silver wire, D C C No. 28.....	About 1 lb.....			.....
Wheatstone bridge.....	One for class...	2917	2473	H 3201
Galvanometer, D'Arsonval.....	One for class...	2845	2414	H 3001
Small glass tubing, 1/8.....	2 lbs.....	5638	4981	.....
Plane mirror.....	One for 2.....	3429	3201	.....
Plate-glass rectangle.....	One for 2.....	3621	3301	.....
Double-convex lens, 6-inch focus, Convex lens with mounting and wire screen.....	One for 2.....	3399	3281	H 4601
Screen holders.....	One for 2.....	3463	3288	.....
Lens support.....	One for 2.....	3460	3285	.....
Pr. blocks to support meter stick, Condenser clamp.....	One for 2.....	3459	3290	.....
	One for 4.....	5399	4717	.....
{ Iron tripod base, 6 lbs.....	One for 4.....	4302	2	S 602
{ Iron rods to fit, 13 mm. x 40 cm	One for 4.....	4341	21	S 204
{ Right-angle piece.....	One for 4.....	4357	38	S 1001
Or this set of supports, tripod rod, clamp, burette holder.....	One for 4.....			H 1002
Tripod for Bunsen burners 5-in..	One for school..	{ 6010 5 or 6	{ 5443 5 or 6 }	.....
Ring clamp, 4 in.....	One for 4.....	5899	5201	.....

\* Filled.

† Not filled.

## REFERENCE BOOKS.

BOOKS OF ABOUT THE SAME GRADE AS THE HIGH-SCHOOL WORK.

A First Course in Physics, Millikan &amp; Gale; Ginn &amp; Co., Chicago.

A Laboratory Course in Physics, Millikan &amp; Gale; Ginn &amp; Co., Chicago.

Laboratory Manual of Physics, Cheston, Dean &amp; Timmerman; American Book Company, New York.

Physical Laboratory Manual, Coleman; American Book Company, Chicago.

Laboratory Manual of Physics, Crew & Tatnall; The Macmillan Company, Chicago and New York.

Manual of Experiments in Physics, J. S. Ames & J. A. Bliss; Harper Bros., New York. This is a somewhat more advanced book, but very good to have in the library.

ADVANCED BOOKS FOR REFERENCE.

A Text Book of Physics, Watson, and—

Elementary Practical Physics (lab.), Watson; Longmans, Green & Co., New York and Chicago.

GENERAL READING AND OF HELP TO THE INSTRUCTOR.

On Laboratory Arts, Richard Threlfall; The Macmillan Company. (Tells how to do things.)

The Art of Projecting, A. E. Dolbear; Lee & Sheperd, Boston.

On Sound, Tyndall; Harper Bros. (Popular lectures; classics.)

Soap Bubbles, C. V. Boys. (Romance of Science series.) (Get from McClurg & Co., Chicago.) E. & J. J. Young & Co., New York. Popular lectures on soap films, showing many interesting and instructive experiments.

Spinning Tops, Perry. (Romance of Science series.) (Get from McClurg & Co., Chicago.) A most interesting series of lectures on the mechanics of spinning bodies. Popular style.

Pioneers of Science, Oliver Lodge; The Macmillan Company. Very interesting and inspiring. Popular style.

Tables of Constants, Smithsonian Physical Tables, Smithsonian Institution, Washington, D. C.

History of Physics, Cajori; The Macmillan Company.

CHEMISTRY. *One unit.*

The work in chemistry consists of two parts, the study of the text and the laboratory work. The year's work should be about equally divided between these two parts. Both the text-book matter and the laboratory work should be included in the recitation. This period should be enlivened by experiments and illustrations by the teacher, especially performing experiments illustrating laws which are too difficult for the pupils in their laboratory work.

The work outlined can be most satisfactorily accomplished by having two recitations of forty-five minutes each, two laboratory periods of ninety minutes each, and a forty-five minute period for review, examination or lecture per week.

It is better to complete a portion of the work thoroughly rather

than cover the whole subject and not master it. Pupils who have done laboratory work in the proper way and can show their original notes, who have thoroughly completed a good text as far as the metals, and who can write reactions and solve problems involving this part of the text will be allowed an entrance unit at the University. This includes about the first sixty experiments and the part of the text which they supplement.

The following outline, based on the state text, is intended to present in clear form the subject-matter for a year's work. It will be found helpful, particularly to the inexperienced teacher. It is intended only as a guide, not in any sense to take the place of the text. The resourceful instructor will modify and adapt it to the conditions under which the course must be given.

#### TEXTS.

#### I. Introduction.

1. The metric system.
  - (1) The unit of length, of capacity, of weight; their relations, and the standard of each.
2. Thermometers.
  - (1) Fahrenheit and Centigrade, relation.
3. Relation of chemistry and physics.
  - (1) Physical change.
  - (2) Chemical change.
  - (3) Mechanical mixture.
  - (4) Chemical compound.
  - (5) Things that cause chemical action.
4. The elements.
  - (1) Distinguish from compounds.
  - (2) Relative importance of twenty.
  - (3) Symbols.
  - (4) Reagents and reactions.
5. Importance of the study of chemistry.
  - (1) To make exact thinkers.
  - (2) To assist in the study of other subjects.
  - (3) To develop the power to do things.
  - (4) The commercial side.
6. The laboratory apparatus for the individual pupil.
  - (1) Names of articles.
  - (2) Uses.
  - (3) Care.
7. The laboratory in general.
  - (1) Care of apparatus for class use.
  - (2) Cleanliness of tables, floor, sinks, hoods, etc.
  - (3) Methods of distributing chemicals.
  - (4) How to handle chemicals.

## II. Hydrogen.

1. History and derivation of the name.
2. Where found.
3. Preparation.
  - (1) By the electric current on water.
  - (2) By the action of certain metals on water.
  - (3) By steam on hot iron.
  - (4) By the action of acids on metals.
  - (5) Purification and cautions.
  - (6) Reactions and equations by symbols.  
$$\text{Zinc} + \text{Hydrochloric acid} = \text{Zinc chlorid} + \text{Hydrogen.}$$
$$\text{Zn} + 2 \text{HCl} = \text{ZnCl}_2 + \text{H}_2.$$
  - (7) Solve problems.
4. Physical properties.
  - (1) Its form at ordinary temperature.
  - (2) Color.
  - (3) Odor.
  - (4) Diffusibility.
  - (5) Density.
  - (6) Solubility in water.
  - (7) Weight of one liter.
  - (8) Conditions under which it may be changed to a liquid or to a solid.
5. Chemical properties.
  - (1) Its activity when mixed with other substances at different temperatures.
  - (2) Compounds of hydrogen made in the laboratory.
  - (3) Combustibility and equation for products formed.
  - (4) Test for hydrogen.
6. Commercial uses.
  - (1) Lime light.
  - (2) Reducing agent.
  - (3) Balloons.
7. General topics.
  - (1) Combining weights.
  - (2) Law of constant proportions by weight.
  - (3) Occlusion of hydrogen by platinum and palladium.

## III. Oxygen.

1. History of its discovery.
2. Occurrence in nature, both free and combined.

III. Oxygen—*continued*:

## 3. Preparation.

- (1) By electrolysis of water.
- (2) By heating mercuric oxid.
- (3) By heating potassium chlorate.
- (4) By heating manganese dioxid.
- (5) By heating a mixture of potassium chlorate and manganese dioxid.
- (6) The equations for each of the above reactions.
- (7) Solve problems.

## 4. Physical properties.

- (1) Form.
- (2) Color.
- (3) Odor.
- (4) Density.
- (5) Diffusibility.
- (6) Solubility in water.
- (7) Weight of one liter.
- (8) Liquid or solid oxygen.

## 5. Chemical properties.

- (1) Activity at different temperatures.
- (2) Compounds of oxygen made in the laboratory.
- (3) Ability to support combustion.
- (4) The oxids.

## 6. General Topics.

- (1) Deflagration.
- (2) Oxidation and reduction.
- (3) Combustion, ordinary, slow, and spontaneous.
- (4) The flame.
- (5) Kindling temperature.
- (6) Davy lamp.

## IV. Compounds of hydrogen and oxygen.

## 1. Water.

- (1) Decomposition by electrolysis.
- (2) Composition by synthesis.
- (3) Natural waters and their impurities.
- (4) Methods of purifying.
- (5) Hard and soft waters.
- (6) Water in combination.
- (7) Action of sodium and potassium on water.
- (8) Uses of water.

## 2. Hydrogen peroxid.

- (1) Methods of making.
- (2) Uses.

IV. Compounds of hydrogen and oxygen—*continued*:

3. General topics.

- (1) Solution.
- (2) Saturation.
- (3) Solubility.
- (4) Synthesis.
- (5) Analysis.
- (6) Qualitative analysis.
- (7) Quantitative analysis.
- (8) Distillation.
- (9) Filtration.
- (10) Deliquescence.
- ( 1) Efflorescence.
- (12) Hygroscopic.
- (13) Dehydrating.

V. Chemical equations and calculations.

1. Quantitative meaning of symbols.
2. Knowledge required for writing equations.
3. Combining weights.
4. Naming of salts from different acids.
5. Naming of different salts of the same elements.

VI. Chlorin.

1. Occurrence.
2. Methods of preparing.
  - (1) Manganese dioxid and hydrochloric acid.
  - (2) Manganese doxid, sodium chlorid and sulfuric acid.
  - (3) Bleaching-powder and acid.
  - (4) Nitric acid and hydrochloric acid.
  - (5) Deacon's process.
  - (6) Electrolysis of a chlorid.
  - (7) Equation for each reaction.
  - (8) Problems.
3. Physical properties.
  - (1) Form.
  - (2) Color.
  - (3) Odor.
  - (4) Density.
  - (5) Diffusibility.
  - (6) Weight of one liter.
  - (7) Conditions under which it may be changed to a liquid or to a solid.

VI. Chlorin—*continued*:

## 4. Chemical properties.

- (1) Its action on hydrogen, metals, ammonia, turpentine and water.
- (2) Compounds containing chlorin.
- (3) Commercial uses.

## 5. General topics.

- (1) Making and crystallizing salts.
- (2) Separating salts by their solubility.
- (3) Uses of litmus paper.

## VII. Hydrochloric acid.

## 1. Occurrence in nature.

## 2. Preparation.

- (1) Sulphuric acid on a chlorid.
- (2) As a by-product.
- (3) Equations for the reactions.
- (4) Problems.

## 3. Physical properties.

- (1) Form.
- (2) Color.
- (3) Taste.
- (4) Odor.
- (5) Density.
- (6) Solubility in water.
- (7) How changed to a liquid.

## 4. Chemical properties.

- (1) Volumetric composition.
- (2) Gravimetric composition.
- (3) Action on metals.
- (4) The chlorids.

## 5. Commercial uses.

## 6. General topics.

- (1) General method of making acids.
- (2) Properties of acids in general.

## VIII. Acids, bases, and salts.

## 1. Define each.

## 2. Learn symbols and names of twenty acids, ten bases, and name all their salts.

## 3. Action of acids on bases; on oxids.

## 4. Salts.

- (1) Normal.
- (2) Acid.
- (3) Basic.

VIII. Acids, bases, and salts—*continued*:

5. Basicity and acidity.
6. General method of naming acids.
7. Naming of bases and salts.
8. Problems involving neutralization.

IX. Nitrogen.

1. Occurrence.
2. Preparation.
  - (1) From the air.
  - (2) By heating a mixture of sodium nitrite and ammonium chlorid.
  - (3) Equations for reactions and problems.
3. Physical properties.
  - (1) Form.
  - (2) Color.
  - (3) Odor.
  - (4) Density.
  - (5) Weight of one liter.
  - (6) Solubility.
  - (7) Conditions necessary to make it a liquid.
4. Chemical properties.
  - (1) Its inactivity.
  - (2) Methods of uniting it with other substances.
  - (3) Compounds containing nitrogen.
5. General topics.
  - (1) The atmosphere.
    - a. A mechanical mixture.
    - b. Constituents.
      - (a) Oxygen. (b) Nitrogen. (c) Water. (d) Argon. (e) Carbon dioxide. (f) Nitric acid. (g) Ammonia. (h) Hydrogen sulfid. (i) Sulfur dioxide. (j) Helium. (k) Krypton. (l) Xenon. (m) Hydrogen. (n) Neon. (o) Dust. (p) Bacteria.
    - c. Liquid air.
  - (2) The volume of gases.
    - a. Boyle's law.
    - b. Charles's law.
    - c. Avogadro's hypothesis.
    - d. The molecular and atomic theories.
    - e. Use of the barometer.

IX. Nitrogen—*continued*:

## 5. General topics.

## (2) The volume of gases.

## f. Combine Boyle's and Charles's law into

$$\text{the formula } V_0 = \frac{V(P-A)}{76 [1 + (.00366 \times t)]}$$

where  $V_0$  = volume at normal conditions,  $P$  = reading of the barometer,  $A$  = aqueous tension for  $t$ , the temperature.

## g. Give many problems on the gas laws.

## X. Nitrogen compounds.

## 1. Ammonia.

## (1) Occurrence.

## (2) Preparation.

a. From glue and a base.

b. From an ammonium salt and a base.

c. Heat ammonium hydroxid.

## (3) Physical properties.

a. Form.

b. Color.

c. Odor.

d. Density.

e. Solubility in water.

f. Weight of one liter.

g. Conditions under which it can be made a liquid.

h. Commercial uses.

## (4) Chemical properties.

a. Activity.

b. Burns in oxygen.

c. Unites with chlorin, etc.

d. Composition of ammonia.

e. Test by which it is known.

## (5) Ammonium salts.

## 2. Nitric acid.

## (1) History.

## (2) Preparation.

a. By the general method.

b. Equation for reaction and problems.

## (3) Physical properties.

a. Form.

b. Color.

c. Taste.

X. Nitrogen compounds—*continued*:

## 2. Nitric acid.

## (3) Physical properties.

- d. Solubility.
- e. Density.
- f. Boiling point.

## (4) Chemical properties.

- a. Activity.
- b. Oxidizing agent.
- c. Action on metals.
- d. *Aqua regia*.

## (5) Oxids of nitrogen.

- a. Nitrous oxid.
- b. Nitric oxid.
- c. Nitrogen dioxid.
- d. Nitrogen trioxid.
- e. Nitrogen tetroxid.
- f. Nitrogen pentoxid.

## (6) Occurrence of the nitrates in nature.

## (7) Manufacture of potassium nitrate.

## (8) Uses of the nitrates.

- a. Powder.
- b. Nitroglycerin.
- c. Guncotton.
- d. Celluloid.
- e. Nitrobenzene.

## 3. General topics.

- (1) Explosives.
- (2) Law of multiple proportions by weight.
- (3) Law of multiple volumes.

## XI. Sulfur.

## 1. Occurrence and preparation of the crude product.

## 2. Physical properties.

- (1) Allotropic forms.
- (2) Melting-point and boiling-point.

## 3. Chemical properties.

- (1) The formation of sulfites, sulfates and sulfids.

## 4. Uses of sulfur.

## 5. Hydrogen sulfid.

- (1) Preparation.
- (2) Properties.
- (3) Uses.

## 6. Carbon bisulfid.

- (1) Properties and uses.

XI. Sulfur—*continued*:

7. Oxids of sulfur.
8. Sulfuric acid.
  - (1) Manufacture of.
  - (2) Properties and uses.
  - (3) Purification.
  - (4) Equations for reactions.
9. Sulfurous acid.
  - (1) How made, properties, and uses.
10. Other acids and salts that contain sulfur.
11. General topics.
  - (1) Molecular mass of gases determined.
    - a. By comparing with other gases.
    - b. Victor Meyer method.
  - (2) Molecular mass of other substances.
    - a. Boiling-point.
    - b. Freezing-point.
    - c. Quantitative analysis.
  - (3) Determination of the formula after the substance is analyzed.
  - (4) Nascent.
  - (5) Molecular mass.
  - (6) Valence.
  - (7) Equations by volume.
  - (8) Graphic formula.
  - (9) Isomerism.
  - (10) Allotropism.
  - (11) Polmerism.

## XII. Carbon.

1. Where found.
2. Forms.
3. Manufacture of charcoal.
4. Carbon dioxid and monoxid.
  - (1) Preparation.
  - (2) Properties.
  - (3) Uses.
5. The salts of carbonic acid.
6. Baking-powders.
7. Organic chemistry and its possibilities.
  - (1) Serial relation of hydrocarbons and their substitution products.
  - (2) Organic acids and their occurrence in nature.
  - (3) The carbohydrates.
  - (4) Alcohols.

**XII. Carbon—continued:**

7. Organic chemistry and its possibilities.
  - (5) Benzene and some of its derivatives.
  - (6) The alkaloids.

**XIII. The halogen family.**

1. Chlorin.
2. Bromin.
3. Iodin.
4. Fluorin.

(Adapt the outline on chlorin [VI] to each of them.)

5. Name and classify all the acids that contain a halogen.
6. Give the names and formulas of all the sodium, all the calcium, all the aluminum, and all the stannic salts of all the halogen acids.

**XIV. The nitrogen family.**

1. Nitrogen, phosphorus, [antimony, arsenic, and bismuth.

(Adapt the outline on nitrogen [IX] to each of them.)

2. The oxids, and the acids of each.
3. Use of each element and of its salts.
4. The hydrogen compound with each.
5. General topics.
  - (1) Matches.
  - (2) Natural families.
  - (3) Periodic law.

**XV. Silicon and boron.**

(Apply the general outline to these.)

1. General topics.
  - (1) Glass.
  - (2) Sand.

**XVI. Ionization.**

1. When heated.
2. In solutions.
3. Evidences of.
4. Equations for reactions representing ions.
5. Cations and anions.
6. Hydrolysis.

**XVII. Metals.**

1. Ores and minerals.
2. Methods of extracting metals from ores.
3. Alkali metals.
  - (1) Lithium.
  - (2) Sodium.
  - (3) Potassium.
  - (4) Ammonium.

XVII. Metals—*continued*:

## 4. The alkali-earth metals.

- (1) Calcium.
- (2) Barium.
- (3) Strontium.
- (4) Magnesium.

## 5. Other metals.

(Apply the general outline found below to each of these metals.)

- (1) Zinc.
  - (2) Mercury.
  - (3) Cadmium.
  - (4) Copper.
  - (5) Silver.
  - (6) Gold.
  - (7) Aluminum.
  - (8) Iron.
  - (9) Cobalt.
  - (10) Nickel.
  - (11) Manganese.
- (Apply the general outline to each.)
- (12) Chromium.
  - (13) Lead.
  - (14) Tin.
  - (15) Platinum.
  - (16) Study the qualitative tests for these metals.
  - (17) Name and give composition of their ores.
  - (18) Method of abstracting them from their ores.
  - (19) Their salts, and uses to which they are put.

## OUTLINE.

In studying the elements and their compounds a general outline like the following will be helpful:

## I. Occurrence.

Free in nature; compounds found in nature.

## II. Physical properties.

Form; color; diffusibility; density; odor; solubility; weight of one liter; melting-point; boiling-point; conditions under which it may be changed to other forms.

## III. Chemical properties.

Active or inactive; other forms found in the laboratory; combustibility; ability to support combustion; action on water.

## IV. Methods of making in the laboratory.

The reactions; how collected; how purified.

## V. Test by which it is recognized.

## VI. Problems.

## VII. Commercial uses.

## LECTURE WORK.

The apparatus for illustration and lecture work may be made as expensive as any school board wishes to afford; but a teacher may do good work with a small amount, if it is judiciously purchased. Get the small and necessary apparatus first and add to it year by year.

The following list is as complete as any high school needs:

## APPARATUS FOR THE LECTURE-TABLE, STOREROOM AND SPECIAL WORK.

ARTICLE.	Kind.	Size.	Number.	Cost.
A large table†.....				
Apparatus*.....	Electrolytic, with removable electrodes.....		1.....	\$10 00
Apparatus.....	Kipp's.....	2-quart.....	2.....	12 00
Balance*.....	Chemical.....		1.....	100 00
Bath*.....	Water.....	6-inch.....	1.....	1 75
Beakers.....	Griffin.....	1-8.....	2 nests.....	4 00
Bottles.....	Reagent.....	250 c.c.....	24.....	4 80
Bottles*.....	Salt mouth g. s.....	500 c.c.....	48.....	8 00
Bottles*.....	Salt mouth g. s.....	1000 c.c.....	48.....	9 00
Casseroles*.....	R. B. porcelain.....	Number 4.....	2.....	1 20
Clamps and collars.....	4-finger.....	Large.....	2 of each.....	2 00
Condensers.....	Glass.....	6 cm.....	2.....	2 50
Corkscrew.....	Ordinary.....	Large.....	1.....	15
Crucibles*.....	Porcelain.....	Number 0.....	12.....	1 20
Cylinders.....	Gas.....	Large.....	6.....	1 80
Cylinders.....	Graduated.....	250 and 500 c.c.....	2.....	2 50
Desiccator*.....	Glass.....	6-inch.....	1.....	1 50
Dishes*.....	Crystallizing.....	1-10.....	1 nest.....	1 50
Dishes*.....	Evaporating, porcelain.....	Number 10.....	2.....	3 00
Flasks.....	Distilling.....	500 c.c.....	4.....	1 30
Flasks.....	Erlenmeyer.....	500 c.c.....	10.....	1 50
Flasks.....	German.....	1000 c.c.....	10.....	2 00
Flasks*.....	Graduated.....	100, 250, 500, 1000 c.c.....	4.....	3 00
Flasks.....	Round bottom, short neck.....	2000 c.c.....	4.....	1 20
Funnels.....	Glass.....	8-inch and 6-inch.....	2.....	75
Funnels*.....	Separatory.....	150 c.c.....	2.....	1 50
Gas-holder*.....	Zinc.....	5-gallon.....	1.....	11 00
Hydrometers*.....	Alcohol, light and heavy liquids.....		3.....	3 00
Mortar and pestle.....	Wedgewood.....	6-inch.....	2.....	2 00
Oven*.....	Drying.....	8x12 inches.....	1.....	10 00
Pinch-cocks.....	Hoffman's.....	Medium.....	2.....	80
Pneumatic troughs.....	Glass.....	6x8x12.....	2.....	5 00
Retort.....	Copper.....	1 pint.....	1.....	1 50
Rule.....	Metric.....	1 meter long.....	1.....	50
Stands.....	Burette.....	2 clamps.....	2.....	3 00
Stands.....	Ring.....	Large.....	2.....	1 50
Stands.....	Filter.....	For four funnels.....	2.....	2 00
Tongs*.....	Crucible.....		1 pair.....	50
Triangles*.....	Porcelain.....	Medium.....	6.....	60
Tube*.....	Hoffman's.....	100 c.c.....	1.....	3 00
Tubes.....	Test.....	8-inch.....	50.....	1 50
Tubes.....	Test on foot.....	8-inch.....	12.....	1 50
Tubes.....	U.....	6-inch.....	12.....	1 50
Wash-bottle.....	Wicker neck.....	1 liter.....	2.....	1 25
Watch-glasses*.....	Thin.....	12 cm.....	12.....	1 00
Water.....	Apparatus for distilling.....	½ gallon per hour.....	1.....	30 00
Weights*.....	Analytical.....	1 mg.—50 gms.....	1 set.....	10 00

\* In small schools where the means are limited apparatus marked with an asterisk may be omitted.

† Should be in front part of classroom, with gas connections, sink and water.

LIST OF LABORATORY EXPERIMENTS TO BE PERFORMED BY  
EACH PUPIL.

This outline is not intended to be a laboratory manual for the pupil; it is only suggestive, and for the teacher only.

In arranging these experiments three ideas have been constantly in mind; the intellectual development and training of the pupil; the practical utility of chemistry; and the preparation of the pupil to continue the work in this subject at higher institutions of learning.

- I. To show a physical and a chemical change.
  1. Heat a platinum wire.
  2. Heat a piece of magnesium wire.
- II. To illustrate some causes of chemical change.
  1. Heat.
  2. Light.
  3. Friction.
  4. Solution.
  5. Electricity.
- III. To show the difference between a mechanical mixture and a chemical compound.
  1. Iron filings and sulfur.
  2. Separate by carbon bisulfid.
  3. Separate by hydrochloric acid.
  4. Unite them chemically.
- IV. To make hydrogen by the action of a metal on water.
  1. Sodium.
  2. Potassium.
  3. Magnesium (hot water).
- V. To make hydrogen by the action of an acid on a metal and show its properties.
  1. To show its lightness.
  2. Diffusibility.
  3. Burn it.
  4. Product of combustion.
  5. The salt formed by the action of the acid on the metal.
- VI. To illustrate the law of constant proportions.
  1. A fixed weight of magnesium on acid.
  2. Problems.
- VII. Methods of making oxygen.
  1. From mercuric oxid.
  2. From potassium chlorate.
  3. From manganese dioxid.

- VIII. To make oxygen and to study its properties.
1. Burn sulfur, phosphorus, carbon, sodium, and iron in it.
  2. Study the products of their combustion.
- IX. Make a synthesis of water.
1. By hydrogen over hot copper oxid.
- X. Water contained in vegetable and animal substances.
1. Wood, meat, potato, etc.
- XI. Water of crystallization.
1. Zinc sulfate, gypsum, "copper" sulfate.
- XII. Precipitate calcium carbonate from water by boiling.
1. Impurities in natural waters.
- XIII. Purify water by—
1. Filtration.
  2. Settling.
  3. Distillation.
  4. Boiling.
- XIV. Efflorescence.
1. Sodium carbonate.
  2. Zinc sulfate.
  3. Sodium sulfate.
- XV. Deliquescence.
1. Calcium chlorid.
  2. Sodium hydroxid.
- XVI. Water as a solvent of
1. Sodium chlorid.
  2. Alum.
  3. Manganese dioxid.
  4. Barium sulfate.
  5. Glycerin.
  6. Chloroform.
  7. Ammonia.
- XVII. Prepare and study the properties of chlorin.
1. Solubility.
  2. Action on antimony.
  3. On phosphorus.
  4. On copper.
  5. On turpentine.
  6. Uses as a bleaching agent.
- XVIII. Chlorin made from bleaching-powder.
1. Used as ink eradicator.
- XIX. Make potassium chlorate and potassium chlorid.
1. Separate them.
  2. Test each product.

- XX. Make and study the properties of hydrochloric acid.
1. Solubility.
  2. Combustibility.
  3. Action on litmus paper.
  4. Action of the gas on ammonia.
  5. Test a solution of the gas.
  6. Add some to zinc.
  7. Add some to manganese dioxid.
  8. Taste a very dilute solution.
  9. Crystallize the salt formed.
- XXI. Neutralize a solution of—
1. Hydrochloric acid.
  2. Sulfuric acid.
  3. Nitric acid, with solution of—
    1. Sodium hydroxid.
    2. Calcium hydroxid.
    3. Ammonium hydroxid.
    4. Barium hydroxid.
  4. Crystallize the salts formed.
- XXII. Make and study the properties of nitrogen.
1. Sodium nitrite and ammonium chlorid heated.
- XXIII. Make nitrogen from the air.
1. By phosphorus.
- XXIV. Determine the amount of oxygen in the air.
1. By volume.
  2. By weight.
- XXV. Show the presence of moisture in the air.
1. Calcium chlorid.
  2. Sodium hydroxid.
- XXVI. Test the air for carbon dioxid.
1. With lime-water or baryta-water.
- XXVII. Make ammonia and study its properties.
1. With glue and calcium hydroxid.
  2. Ammonium chlorid and sodium hydroxid solution.
  3. Ammonium nitrate and potassium hydroxid.
  4. Ammonium chlorid and lime.
  5. Test its solubility.
  6. Temperature change on solution.
  7. Density compared with air.
  8. Combustibility.
  9. Action on hydrochloric acid gas, etc.
- XXVIII. Preparation and properties of nitric acid.
1. Use of sodium nitrate and sulfuric acid.
  2. Action of the acid on metals, magnesium, copper, tin, etc.

XXIX. Preparation and properties of a nitrite.

1. Sodium nitrate and lead.
2. Nitrous acid.
3. A reducing agent.
4. Distinguish a nitrate from a nitrite.

XXX. Nitrogen tetroxid and nitrogen dioxid.

1. Heat lead nitrate.
2. Combustibility.
3. Change the one to the other.

XXXI. Nitric oxid and its properties.

1. Copper and dilute nitric acid.
2. Action on air.
3. Solubility and combustibility.
4. Burn red phosphorus in it.
5. Crystallize the copper nitrate.

XXXII. Nitrous oxid and its properties.

1. Heat ammonium nitrate.
2. Water and nitrous oxid is formed.
3. Solubility, odor, etc.
4. Supports combustion.

XXXIII. Allotropic forms of sulfur.

1. Properties of roll sulfur.
2. Forms.

(1) Rhombic. (2) Plastic. (3) Monoclinic.

XXXIV. Preparation and properties of hydrogen sulfid.

1. Combustibility and ability to support combustion.
2. Action on litmus, silver, etc.
3. Action on salts of metals in acid solution.
  - (1) Copper, (2) lead, (3) arsenic, (4) antimony, (5) mercury, (6) Cadmium.
4. Action on salts of metals in alkaline solution.
  - (1) Sodium, (2) calcium, (3) zinc, (4) iron(ous), (5) iron(ic), (6) manganese.

XXXV. Sulfur dioxid and its properties.

1. Burn sulfur.
2. Anhydrid of sulfurous acid.
3. Bleaching agent.
4. Also made by the action of sulfuric acid on copper.

XXXVI. To make sulfates.

1. Any soluble sulfate, barium chlorid, etc.
2. Test for sulfate.

## XXXVII. Properties and forms of carbon.

1. Diamond.
2. Graphite.
3. Amorphous.

(1) Charcoal, (2) lampblack, etc.

## XXXVIII. Carbon as an absorbent.

1. Litmus solution and animal charcoal, etc.
2. Cold charcoal and gases.

## XXXIX. Carbon a reducing agent.

1. Copper oxid and carbon.
2. Arsenic trioxid and animal charcoal.

## XL. The action of acids on carbonates.

1. A salt and carbon dioxid formed.

## XLI. Carbon dioxid in the breath.

1. Lime-water.

## XLII. Preparation and properties of carbon dioxid.

1. Effect on water.
2. Combustibility.
3. Density.
4. Pass through lime-water.
5. Make the acid carbonate.

## XLIII. Preparation of the carbonate.

1. From sodium hydrate.

## XLIV. Carbon monoxid.

1. From oxalic acid.
2. Properties.

## XLV. Preparation and properties of methane.

1. Sodium acetate and soda lime.
2. Physical properties.
3. Chemical properties.
4. Natural gas.

## XLVI. To determine molecular masses.

1. Alcohol.
  - (1) By freezing-point.
  - (2) By boiling-point.

2. Gases.

(1) By comparison of weights.

## XLVII. The structure of a flame.

1. Bunsen's flame.
2. Candle flame.
3. Hydrogen flame.

**XLVIII. Prepare and study the properties of bromin.**

1. Potassium bromid, manganese dioxid and sulfuric acid.
2. Density of the liquid.
3. Solubility.
4. Test for bromin.
5. Replaced by chlorin.
6. Action on sodium hydroxid.

**XLIX. Iodin and hydriodic acid.**

1. Potassium iodid, manganese dioxid and sulfuric acid.
2. Test for free iodin.
3. Replaced by bromin and chlorin.
4. Sublime it.
5. Solubility in water, in alcohol.
6. Iodin solution and hydrogen sulfid.

**L. Hydrofluoric acid.**

1. Etch glass.

**LI. The silver halides.**

1. Silver nitrate and sodium chlorid.
2. Potassium bromid.
3. Potassium iodid.
4. Solubility of each precipitate in ammonium hydrate.

**LII. Hydrogen peroxid.**

1. Sodium peroxid and water made acid by sulfuric acid.
2. Oxidizing agent.
3. Reducing agent.
4. Test for.
5. Action on a solution of potassium permanganate.

**LIII. Phosphorus and phosphoric acid.**

1. Solubility of red and of yellow phosphorus in carbon bisulfid.
2. Change the red to yellow by heating in a closed tube.
3. Add silver nitrate, calcium chlorid, magnesium sulfate and ammonia water to a solution of phosphoric acid.

**LIV. Arsenic and its compounds.**

1. Reduce arsenic trioxid.
2. Dissolve in hydrochloric acid and add hydrogen sulfid.
3. Add sodium hydrate to arsenic trioxid.
4. Oxidize some arsenic.

- LV. Antimony and its compounds.
1. Action of acid on the metal.
  2. Pass hydrogen sulfid into the solution made by *aqua regia*.
  3. Dissolve some tartar emetic and pass hydrogen sulfid into the solution.
  4. Reduce some antimony trioxid.
  5. Oxidize some antimony.
- LVI. Bismuth and its compounds.
1. Properties of the metal.
  2. Dissolve some bismuth nitrate; add hydrochloric acid to prevent hydrolysis.
  3. Add much water to some of this solution.
  4. Add hydrogen sulfid to the remainder.
- LVII. Borax and boric acid.
1. Make borax beads on the end of a platinum wire.
  2. Test for the following with beads: Chromium, manganese, cobalt, nickel.
  3. Make boric acid by adding hydrochloric acid to a hot solution of borax.
  4. Change it back to borax with sodium carbonate.
- LVIII. Evidence of ionization.
1. Solution of silver nitrate on a solution of potassium chlorate.
  2. Solution of silver nitrate and potassium chlorid.
  3. Ammonium hydrate on ferric chlorid.
  4. Ammonium hydrate on a solution of potassium ferrocyanid.
  5. Add water to a dry mixture of soda and cream of tartar.
- LIX. Sodium and its compounds.
1. Properties of sodium.
  2. Heat sodium bicarbonate.
  3. Crystals of sodium salts.
  4. Add a solution of sodium carbonate to solutions of calcium chlorid.
  5. Test for sodium.
  6. Write formulas and names of thirty sodium salts.
  7. Sodium salts react alkaline in solution.
  8. Solubility of sodium salts.
- LX. Potassium and its compounds.
1. Study the physical and the chemical properties of potassium.
  2. Make potassium nitrate from sodium nitrate.
  3. Make gunpowder, explode, and study the residue.

LX. Potassium and its compounds—*continued*:

4. Heat cream of tartar and study the residue.
5. Test for potassium.
6. Write and name twenty-five potassium salts.
7. Solubility of potassium salts, exceptions.

## LXI. Distinction between the salts of the alkali metals.

1. Sodium amalgam and ammonium chlorid.
2. Potassium salts and tartaric acid.
3. Ammonium salts and alkali.
4. Sodium cobalt nitrite and potassium and ammonium salts.

## LXII. Calcium salts.

1. Burn a piece of marble.
2. Add acid to old mortar.
3. Gypsum and water of crystallization.
4. Plaster of Paris and water.
5. Soluble calcium salt in solution, add solutions of ammonium carbonate, oxalate, etc.

## LXIII. Strontium and barium salts.

1. Treat a solution of strontium chlorid with a solution of ammonium chlorid.
2. Treat a like solution of sulfuric acid.
3. Try the flame test.
4. Name some soluble strontium salts; some that are insoluble.
5. Treat the corresponding barium salts in the same way.

## LXIV. Magnesium and its salts.

1. Study its properties, both physical and chemical.
2. To a soluble magnesium salt a solution of sodium carbonate.
3. To the same add ammonium hydroxid and disodium hydrogen phosphate.
4. Action of acid on magnesia.

## LXV. Zinc and its compounds.

1. Physical and chemical properties of zinc.
2. Heat a piece on charcoal.
3. Action of acids on zinc.
4. Action of strong sodium hydrate on zinc.
5. Sodium hydrate on a solution of a zinc salt.
6. Zinc solution and hydrogen sulfid.
7. Solubility of the different zinc salts.

## LXVI. Cadmium salts.

1. Color of the sulfid.
2. Solubility of the sulfid, etc.

## LXVII. Mercury and its salts.

1. Physical and chemical properties.
2. Action on dilute nitric acid.
3. Action on concentrated nitric acid.
4. Distinguish between the "ic" and "ous" salts.
5. Mercury precipitated by other metals.
6. A soluble salt and hydrogen sulfid.

## LXVIII. Copper and its compounds.

1. Properties of the metal.
2. Action of hydrochloric, nitric and sulfuric acid on copper.
3. Solution of copper sulfate on hydrogen sulfid.
4. Fehling's solution and grape-sugar.
5. Replaced by other metals.

## LXIX. Silver and its salts.

1. Properties of the metal.
2. Action of nitric acid on the metal.
3. Sunlight on the halogen salts.
4. Solution and hydrogen sulfid.
5. Solution and a cyanide solution.

## LXX. Aluminum and its compounds.

1. Study the properties of the metal.
2. Action of acids on the metal.
3. The action of sodium hydroxid.
4. Ammonium hydrate on a solution of a salt.
5. Make alum.
6. Action of sodium carbonate on the aluminum hydrate.
7. Use of its salts as a mordant.

## LXXI. Iron and its salts.

1. Properties of the metal.
2. Make ferrous chlorid.
3. Tests for the ferrous salts.
4. Make ferric chlorid and tests for ferric salts.
5. Ferrous sulfate and hydrogen sulfid, alkaline solution.
6. The same, acid solution.
7. Reduction of the "ic" to the "ous" by hydrogen sulfid.

## LXXII. Nickel and cobalt and their salts.

1. Properties of the metals.
2. Make borax beads with their salts.
3. Hydrogen sulfid in both acid and alkaline solution.
4. Color of the different salts and their solutions.

**LXXIII. Manganese compounds.**

1. To make the sulfid.
2. The hydroxid.
3. The permanganate.
4. Reduction by grape-sugar.
5. Manganese dioxid.

**LXXIV. Chromium compounds.**

1. Color of the salts, etc.
2. Make the chromate from the dichromate.
3. Make the dichromate from the chromate.
4. Chromate solution and barium chlorid.
5. Chromic chlorid and sodium hydroxid.
6. Distinguish a chromic salt from a chromate.
7. Change one to the other, and reverse.

**LXXV. Lead and its salts.**

1. Properties of lead.
2. Reduce the oxid.
3. From a solution of a lead salt precipitate the lead salts by hydrochloric acid, potassium chromate, sulfuric acid, sodium hydroxid, etc.
4. Replace lead in its salts by zinc.

**LXXVI. Tin and its compounds.**

1. Properties of the metal.
2. Action of hydrochloric acid on the metal.
3. Mercurous chlorid and stannous chlorid.
4. Precipitate the "ic" and "ous" sulfids.
5. Make "ic" and "ous" hydroxid.
6. Tin replaced in its salts by zinc.
7. Make the oxid.

**LXXVII. To determine the amount of oxygen obtainable from a weighed amount of mercuric oxid.**

1. Hard glass tubing and eudiometer.
2. Apply the gas laws.

**LXXVIII. To determine the amount of crystal water in salts.**

1. Copper sulphate.
2. Potassium alum.

**LXXIX. The law of definite proportions.**

1. Standard solution of hydrochloric acid and potassium hydroxid.

**LXXX. The law of multiple proportions.**

1. Potassium chlorate and potassium perchlorate.

## APPARATUS.

Each pupil should have and be responsible for the following list of apparatus, or as much of it as it is possible to furnish him:

ARTICLE.	Kind.	Size.	Number or amount.	Cost.
Bath.....	Sand.....	10x2 cm.....	1.....	15 cts.
Beakers.....	Plain.....	1-6.....	6.....	50
Blowpipe.....	Brass.....	20 cm. long.....	1.....	10
Bottles.....	Reagent.....	120 c.c. with g. s.....	5.....	75
Burner.....	Bunsen.....	Ordinary.....	1.....	20
Candle holder.....	Wire handle.....	20 cm. long.....	1.....	15
Collar and clamp.....	Two-finger.....	Small.....	1.....	50
Corks.....	Cork.....	Assorted.....	20.....	05
Covers.....	Ground glass.....	10x10 cm.....	2.....	10
Cylinders.....	Gas.....	6x20 cm.....	2.....	60
Cylinder.....	Graduated.....	50 c.c.....	1.....	30
Dish.....	Glass, crystallizing.....	10x20 cm.....	1.....	30
Dish.....	Evaporating, R. B.....	No. 4.....	1.....	30
Files.....	1 round and 1 triangular.....	10 cm.....	2.....	10
Flasks.....	German.....	500, 250, 100 c.c.....	3.....	37
Flask.....	Oxygen.....	150 c.c.....	1.....	15
Flasks.....	Woulff's 2-neck.....	300 c.c.....	2.....	30
Forceps.....	Steel.....	10 cm.....	1 pair.....	10
Funnels.....	Glass.....	8 cm. and 4 c.....m	2.....	18
Gauze.....	Asbestos.....	10x10 cm.....	1.....	05
Magnet.....	Horseshoe.....	Small.....	1.....	05
Matches.....	Safety.....	.....	2 boxes.....	02
Mortar and pestle.....	Porcelain.....	No. 4.....	1.....	30
Paper.....	Drying.....	Large.....	4 sheets.....	04
Paper.....	Cut filter.....	10 cm.....	50.....	07
Paper.....	Litmus.....	Large.....	1 sheet.....	05
Pneumatic trough.....	Tin.....	20x80x10 cm.....	1.....	25
Retort.....	Hard glass.....	250 c.c.....	1.....	30
Ring stand.....	Iron.....	Large.....	1.....	50
Rings.....	Iron.....	1 large, 1 small.....	2.....	30
Spatula.....	Horn.....	10 cm.....	1.....	10
Spoon.....	Deflagrating.....	.....	1.....	15
Stoppers.....	1 one-holed and 1 two-holed rubber.....	No. 5 and No. 6.....	2.....	15
Test-tube holder.....	Wire.....	10 cm. long.....	1.....	10
Test-tube rack.....	Wooden.....	Small.....	1.....	15
Towel.....	Linen.....	1 yard.....	1.....	10
Tripod.....	Iron.....	Medium size.....	1.....	30
Tube.....	Calcium chlorid.....	10 cm.....	1.....	10
Tubes.....	Specimen.....	10x2 cm.....	12.....	24
Tubes.....	Test.....	12x1.5 cm.....	12.....	24
Tube.....	Thistle.....	20 cm. long.....	1.....	10
Tubing.....	Hard glass.....	6 mm.....	30 gms.....	05
Tubing.....	Hard glass.....	15 mm.....	20 gms.....	03
Tubing.....	Soft glass.....	6 mm.....	200 gms.....	15
Tubing.....	Maroon rubber.....	4 mm.....	100 cm.....	15
Tubing.....	For Bunsen burner.....	6 mm.....	60 cm.....	20
Watch-glass.....	Light.....	5 cm. in diameter.....	2.....	10
Wire.....	Copper.....	Small.....	100 cm.....	01
Wire.....	Platinum.....	Small.....	5 cm.....	10

If all the experiments are to be performed, the following list of class apparatus is necessary:

1.—For the use of the class.

ARTICLE.	Kind.	Size.	Number.	Cost.
Balance.....	In a case.....	8-inch beam.....	1	\$10 00
Barometer.....	Metric.....		1	10 00
Bellows.....	Foot.....	Medium.....	1	6 00
Blast lamp.....	Bunsen's.....		1	3 50
Bottles.....	Glass-stoppered.....	500 c.c.....	24	4 00
Cork-borers.....	Hard brass.....	1-5.....	1 set.	60
Cork-press.....	Rotary.....	Ordinary.....	1	60
Hood.....	With good draft.....	6 feet wide.....	1	(?)
Jars.....	Crockery.....	2 gallons.....	2	40
Jars.....	Crockery.....	1 quart.....	12	60
Mortar and pestle.....	Iron.....	1 quart.....	1	75
Table*				125 00
Thermometer.....	Centigrade, for room.....	12-inch.....	1	1 00

\* Should have eight gas connections, four water taps, two sinks, sixteen drawers, and eight cases below.

The above in clean, dry, well-lighted, heated and ventilated room.

2.—To be checked out to the pupils and returned as soon as the experiment is performed.

ARTICLE.	Kind.	Size.	Number.	Cost.
Burettes.....	Mohr's.....	50 c.c.....	4	\$5 00
Dishes.....	Lead.....	4 x 2 x ½ inches.....	4	40
Eudiometers.....	Without platinum wire.....	100 c.c.....	4	6 00
Gauze.....	Wire.....	4 x 4 inches.....	4	40
Magnifying glass.....	Single lens.....	¾ in. in diameter..	1	1 50
Pinch-cocks.....	Mohr's.....	Medium.....	4	48
Weights.....	Metric.....	1 mg. to 50 gms. ...	1 set.	2 50

Chemicals should be bought in quantity from a regular wholesale house. The cost per pupil for the course should not exceed seventy-five cents.

CHEMICALS NECESSARY TO PERFORM ALL THE EXPERIMENTS  
GIVEN IN THE OUTLINE.

- |  |  |  |
|--|--|--|
| 1. Ag foil.                                      | 47. HCl  | 95. $\text{Na}_2\text{HPO}_4$                      |
| 2. $\text{AgNO}_3$                               | 48. $\text{H}_2\text{C}_4\text{H}_4\text{O}_6$     | 96. $\text{NaNO}_2$                                |
| 3. Al wire and filings.                          | 49. $\text{H}_2\text{C}_2\text{O}_4$               | 97. $\text{NaNO}_3$                                |
| 4. $\text{Al}_2(\text{SO}_4)_3$                  | 50. $\text{HC}_3\text{H}_5\text{O}_2$              | 98. $\text{Na}_2\text{O}_2$                        |
| 5. As  | 51. $\text{HNO}_3$                                 | 99. NaOH   |
| 6. $\text{AsCl}_3$                               | 52. $\text{H}_2\text{O}$                           | 100. $\text{Na}_2\text{SO}_3$                      |
| 7. $\text{As}_2\text{O}_3$                       | 53. $\text{H}_2\text{O}_2$                         | 101. $\text{Na}_2\text{SO}_4$                      |
| 8. $\text{BaCl}_2$                               | 54. $\text{H}_3\text{PO}_4$                        | 102. $\text{Na}_2\text{S}_2\text{O}_3$             |
| 9. $\text{Ba}(\text{NO}_3)_2$                    | 55. $\text{H}_2\text{SO}_4$                        | 103. $\text{NH}_4\text{Cl}$                        |
| 10. $\text{Ba}(\text{OH})_2$                     | 56. $\text{H}_2\text{SO}_3$                        | 104. $(\text{NH}_4)_2\text{CO}_3$                  |
| 11. $\text{BaSO}_4$                              | 57. Hg   | 105. $\text{NH}_4\text{NO}_3$                      |
| 12. Bi   | 58. $\text{HgCl}_2$                                | 106. $\text{NH}_4\text{OH}$                        |
| 13. $\text{BiCl}_3$                              | 59. $\text{HgNO}_3$                                | 107. $(\text{NH}_4)_2\text{S}$                     |
| 14. $\text{Bi}(\text{NO}_3)_3$                   | 60. $\text{Hg}(\text{NO}_3)_2$                     | 108. $(\text{NH}_4)_2\text{SO}_4$                  |
| 15. Br   | 61. $\text{HgO}$                                   | 109. $\text{Ni}(\text{NO}_3)_2$                    |
| 16. C charcoal, animal charcoal.                 | 62. I  | 110. P red and yellow.                             |
| 17. $\text{CHCl}_3$                              | 63. K  | 111. Pb  |
| 18. $\text{C}_{10}\text{H}_{16}$                 | 64. $\text{KAl}(\text{SO}_4)_2$                    | 112. $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2$ |
| 19. $\text{CS}_2$                                | 65. KBr  | 113. $\text{Pb}(\text{NO}_3)_2$                    |
| 20. $\text{C}_6\text{H}_{12}\text{O}_6$          | 66. KCN  | 114. $\text{PbO}$                                  |
| 21. $\text{C}_{12}\text{H}_{22}\text{O}_{11}$    | 67. KCl  | 115. S   |
| 22. $(\text{C}_6\text{H}_{10}\text{O}_5)_x$      | 68. $\text{KClO}_3$                                | 116. Sb  |
| 23. $\text{CH}_3\text{OH}$                       | 69. $\text{KClO}_4$                                | 117. $\text{SbCl}_3$                               |
| 24. $\text{C}_2\text{H}_5\text{OH}$              | 70. $\text{K}_2\text{Cr}_2\text{O}_7$              | 118. $\text{Sb}_2\text{O}_3$                       |
| 25. $(\text{C}_2\text{H}_5)_2\text{O}$           | 71. $\text{K}_2\text{CrO}_4$                       | 119. Sn  |
| 26. $\text{C}_3\text{H}_5(\text{OH})_2$          | 72. $\text{K}_4\text{Fe}(\text{CN})_6$             | 120. $\text{SnCl}_2$                               |
| 27. $\text{CaCl}_2$ fused and crystals.          | 73. $\text{K}_3\text{Fe}(\text{CN})_6$             | 121. $\text{SnCl}_4$                               |
| 28. $\text{CaOCl}_2$                             | 74. $\text{KHC}_4\text{H}_4\text{O}_6$             | 122. $\text{Sn}(\text{NO}_3)_2$                    |
| 29. $\text{CaCO}_3$                              | 75. KI   | 123. $\text{SrCl}_2$                               |
| 30. $\text{CaF}_2$                               | 76. $\text{KMnO}_4$                                | 124. $\text{Sr}(\text{NO}_3)_2$                    |
| 31. CaO  | 77. $\text{KNO}_3$                                 | 125. Zn dust and granulated.                       |
| 32. $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$    | 78. $\text{KNO}_2$                                 | 126. $\text{ZnSO}_4$                               |
| 33. $(\text{CaSO}_4)_2 \cdot \text{H}_2\text{O}$ | 79. KOH  | 127. Litmus.                                       |
| 34. $\text{CdSO}_4$                              | 80. $\text{K}_2\text{SO}_4$                        | 128. Methyl-orange.                                |
| 35. $\text{Co}(\text{NO}_3)_2$                   | 81. KSCN   | 129. Cochineal.                                    |
| 36. $\text{CrCl}_3$                              | 82. $\text{KSb}(\text{C}_4\text{H}_4\text{O}_6)_2$ | 130. Indigo.                                       |
| 37. Cu foil wire filings.                        | 83. Mg wire.                                       | 131. Colored calico.                               |
| 38. CuCl   | 84. $\text{MgCl}_2$                                | 132. Phenolphthalein.                              |
| 39. $\text{CuCl}_2$                              | 85. $\text{MgCO}_3$                                | 133. Candles.                                      |
| 40. $\text{Cu}(\text{NO}_3)_2$                   | 86. $\text{MgSO}_4$                                | 134. Splinters.                                    |
| 41. CuO wire form and powdered.                  | 87. $\text{MnO}_2$                                 | 135. Paraffin.                                     |
| 42. $\text{CuSO}_4$                              | 88. $\text{MnSO}_4$                                | 136. Soda-lime.                                    |
| 43. Fe wire and filings.                         | 89. Na   | 137. Sodium amalgam.                               |
| 44. $\text{FeCl}_3$                              | 90. $\text{Na}_2\text{B}_4\text{O}_7$              | 138. Square glass 4x4 in.                          |
| 45. FeS  | 91. NaCl   | 139. Meat.   |
| 46. $\text{FeSO}_4$                              | 92. $\text{NaC}_2\text{H}_3\text{O}_2$             | 140. Vegetables.                                   |
|  | 93. $\text{Na}_2\text{CO}_3$                       |  |
|  | 94. $\text{NaHCO}_3$                               |  |

The chemicals for this work need not be chemically pure, but they should be of a good grade. It is always advisable to keep a small stock of c. p. material in the laboratory for special work.

TEXTS. Essentials of Chemistry, Hesler and Smith; An Elementary Study of Chemistry, McPherson and Henderson; First Steps in Chemistry, Ostwald; Introduction to Chemistry, Remsen.

## Physical Geography.

### THE EARTH.

#### REFERENCES.

1. Davis, *Physical Geography*, pp. 8-17 (edition of 1899).
2. Gilbert and Brigham, *Physical Geography*, pp. 1-27.
3. Chamberlin and Salisbury, *Geologic Processes*, vol. I, pp. 2-5.

#### A. The earth as part of the universe.

1. The universe is made up of millions of systems, of which our solar system is one.
2. The earth is one of the planets of our solar system, which comprises the sun and the planets.

#### B. The relation of the earth to the sun.

1. Distance from sun, 92.9 million miles.
2. Revolves around the sun once in  $365\frac{1}{4}$  days.
3. The mass of the earth is only  $\frac{1}{315511}$  of the mass of the sun.
4. The earth depends upon the sun for its heat and light.

#### C. The relation of the earth to the other planets.

1. The planets of our solar system are: Neptune, Uranus, Saturn, Jupiter, Mars, Earth, Venus, Mercury.
2. Which of the planets are nearer the sun than the earth is?
3. Some of the planets revolve more rapidly around the sun, some more slowly, than the earth does.
4. Some of the planets rotate more rapidly, some less rapidly, than the earth does.
5. Neptune, Uranus, Saturn and Jupiter are larger than the earth; the other planets are smaller.

#### D. The shape of the earth.

1. Early conception that the earth was flat.
2. A globe or spheroid.

#### E. The size of the earth.

1. How determined?
  - a. By measuring the curvature of the earth. (See Davis's *Physical Geography*, appendix B, p. 386.)
  - b. By traveling around the earth and making measurements. (The diameter of the earth is about 8000 miles; the distance to either pole from the center is about thirteen miles less than from the center to the equator.)

#### F. The motions of the earth.

1. Revolution around the sun. Earth goes around sun once in  $365\frac{1}{4}$  days, *i. e.*, once a year.

F. The motions of the earth—*continued*:

## 2. Rotation on its axis.

a. Direction of rotation from west to east. Proof: Body dropped from a tower is deflected to the east.

b. Results of rotation—day and night. (Sunrise and sunset suggest a natural system of directions.)

## 3. Results of the inclination of the axis combined with the annual revolution.

a. Changes in the length of day and night.

b. Seasons.

## G. Latitudes and longitudes.

## 1. What are they? How established?

## 2. Uses of.

a. In locating points on the surface of the earth.

b. In mapping. (Note.—See appendix C, Davis's *Physical Geography*, p. 388.)

## THE ATMOSPHERE.

## REFERENCES.

1. Davis, *Physical Geography*, pp. 18-56.

2. Gilbert and Brigham, *Physical Geography*, pp. 223-273.

2. Chamberlin and Salisbury, *Geologic Processes*, vol. I, pp. 5-7.

A. Is the atmosphere part of the earth, or an envelope? (Mass of the air is  $\frac{1}{1200000}$  of that of the earth.)

## B. Height of the atmosphere, how determined?

1. By means of falling meteorites. They give height of at least 100 miles.

2. *Aurora borealis*. Height 600 miles.

3. The determination of the sphere of gravitative control of the earth gives 620,000 miles as the outside limit of the atmosphere.

## C. Constituents of the atmosphere.

1. Nitrogen—it is a dilutant; it has mechanical effects in connection with the wind; it influences pressure; diathermous to heat.

2. Oxygen—supports animal life and combustion; diathermous to heat.

3. Carbon dioxid (about 4 parts in 10,000).

a. Sources of—animal life, and combustion, expiration, and vulcanism.

b. Uses.

1. Plant life.

2. Weathering.

3. Absorbent of heat.

c. Is there more carbon dioxid in the air in winter than in summer?

C. Constituents of the atmosphere—*continued*:

4. Dust.

a. Effects of.

1. Causes condensation of vapor.
2. Diffusion of light.
3. Colors of the sky. The bright sunset after the volcanic explosions of Krakatoa in 1883 were due to dust in the air.

b. What keeps the dust in the air?

1. Currents.
2. Friction of the air.
3. Possibly electrical conditions.

D. Is air a mixture, or a chemical compound?

E. The heat of the atmosphere.

1. What is heat? The movement of the molecules; temperature is the measurement of impact.

2. How is heat transmitted?

a. By conduction. The molecules retain their relative positions.

b. By convection.

1. By expanding and lifting overlying column:
2. Lateral motion, leveling the surface.

c. By radiation. Radiation is a wave-motion of the molecules of the ether.

3. The thermometer.

a. Principle of.

b. Why take 32° below freezing as zero. (This was the lowest temperature obtainable from a mixture of snow and ice.)

c. Why not use fractions of an inch on a thermometer-tube instead of degrees? Because tubes are not uniform in bore.

4. Isothermal lines.

a. What?

b. Variable or not?

c. If latitude alone affected temperature, what should be the relation between isotherms and parallels?

5. What are the factors influencing temperature?

a. Latitudes.

b. Land and sea.

c. Prevailing winds.

d. Altitude.

6. Why are high altitudes colder than low altitudes?

a. Freer radiation.

b. Less carbon dioxid.

E. The heat of the atmosphere—*continued*:

6. Why are high altitudes colder than low altitudes?
  - c. Less dust.
  - d. Freer circulation of winds.
  - e. Rarer air, which circulates more freely.
  - f. Less moisture.
7. What influence annual range of temperature?
  - a. Latitude.
  - b. Nearness to sea.
  - c. Moisture.
  - d. Altitude.
  - e. Direction of winds. (The greatest range is in north-east Siberia.)
8. What influence the daily range of temperature?
  - a. Length of day.
  - b. Latitude.
  - c. Altitude.
  - d. Nearness to sea.
  - e. Moisture.
  - f. Vegetation. (Its absence allows greatest range.)
  - g. Color of soil. (Black gives greatest range.)
  - h. Time of year. (Note.—Length of day alone considered, we should get greatest range when day and night are equal; latitude alone considered, the greatest range should be when the sun is near its zenith. In the Sahara, range is as much as 70° F. per day.)

## F. The pressure of the atmosphere.

1. How is its existence proved?
2. Amount of pressure—how measured?
3. Principle of the barometer. How high must we go above the sea-level to have mercury drop one inch? (About 1000 feet.)
4. Is pressure constant at any point? What affects pressure?
5. Importance of differences of pressure.
  - a. Cause winds. (What are isobars? What kind of pressure at the equator?)

## G. The moisture of the atmosphere.

1. Evaporation takes place from all moist surfaces; molecules from the surface of the water fly off from collision.
  - a. Upon what does the rate of evaporation depend?
    1. Temperature.
    2. Pressure.
    3. Humidity.
    4. Winds.
  - b. When will evaporation from a surface cease?
2. Relative humidity—depends on temperature.

G. The moisture of the atmosphere—*continued*:

3. Absolute humidity—the absolute amount of water vapor in the air.

## 4. Condensation.

*a.* Relative importance of evaporation and condensation? They balance each other. Evaporation is greater in low latitudes than in high, and greater over oceans than over lands; condensation is greater over coastal than over inland regions; greater in mountains than on plains. The amount condensed on the surface of the earth each year is enough to cover France (20,000 square miles) one mile deep.

*b.* Conditions for condensation.

1. Sufficient humidity for saturation.

2. Dust particles.

*c.* Forms which the condensed water vapor takes:

1. Dew. (a) Dew-point? (b) Dew neither rises nor falls. (c) How formed? (d) Effect of condensation of vapor. Heat is liberated—the condensation of one pound of water will liberate enough heat to melt five pounds of iron. (Explain.) This liberation of heat will prevent the surrounding air from falling below the condensation point. (e) Dew on clear *versus* cloudy nights? (f) Dew on windy *versus* still nights?

*d.* Frost.*e.* Fog.

1. What?

2. Does fog occur more frequently over land or over water in winter?

3. Reasons for fogs southeast of Newfoundland?

4. Fogs in valleys or on hills? Why?

5. Is fog evaporated from the top or from the bottom?

6. Reasons for fogs over lakes, etc.?

*f.* Clouds.

1. What? Condensed vapor at some elevation.

2. Cloud banner. (a) How formed? (As winds ascend a mountain side the pressure becomes less and the air is cooled as it expands and becomes saturated and a banner is formed.) (b) Why does it not grow indefinitely?

3. Classes of clouds. (a) Nimbus. (b) Stratus. (c) Cumulus. (d) Cirrus.

*g.* Rain.

1. Causes of? Saturation of the air by taking to colder air or bringing colder air to it; air may be cooled by taking to higher latitudes or to higher altitudes.

G. The moisture of the atmosphere—*continued*:

## 4. Condensation.

## g. Rain.

2. Of what are clouds from which the rain comes composed?
3. Effect of rain on the air? Takes out dust. Dissolves out gases—carbon dioxid chiefly. Washes out organisms, inorganic particles, etc.
4. Effect of rain on soil? Adds dust. Rain may bring dust from all parts of the world.
5. Blood rains caused by red dust, carried chiefly from the Sahara.

## h. Snow.

1. Relation of snow to rain? Snow is crystallized water vapor; above a plane of  $32^{\circ}$  above zero snow will form; below it, rain.
2. Is the plane of  $32^{\circ}$  constant? It is higher in lower latitudes in summer; varies with air currents. In falling, snowflakes may be increased or decreased, or may evaporate entirely.

## H. General circulation of the atmosphere.

1. What is wind? Air in motion along the surface.
2. Immediate cause of winds? Difference in pressure; air moves from places of high pressure to places of low pressure.
3. Ultimate cause of wind? Differences in temperature; the higher the temperature the lower the pressure. Increase of humidity also decreases pressure.
4. Strength of wind? Depends on difference of pressure per unit of distance, *i. e.*, the barometric gradient.
5. Classes of winds.
  - a. Trade-winds.
  - b. Doldrums. Belts of calms in the equatorial region.
  - c. Antitrade winds.
6. Interference with the general circulation of winds. By—
  - a. Secondary circulation.
  - b. Unequal heating of land and sea.
  - c. Inequalities of land surface.
7. Results of interference with the general circulation.
  - a. Cyclones.
    1. What? A large inward, upward whirl of air.
    2. Pressure? Very low in center, increasing outward.
    3. Moisture.

H. General circulation of the atmosphere—*continued*:

## 7. Results of interference with the general circulation.

## a. Cyclones.

4. Temperature. Warmer in the south and south-east, as the winds are from the southwest. The temperatures may differ  $40^{\circ}$  to  $50^{\circ}$  on the two sides. In general, a cyclone center means relatively high temperatures, as the warm winds going to cooler areas may lose their moisture.
5. Winds. At the surface they move from right to left; above they move outward in the opposite direction. They increase in speed as they approach the center; blow faster on south or southeast sides in our latitudes, owing to the influence of the westerlies.
6. Movements of storms. Move in the direction of the prevailing winds; in the United States, toward the northeast, average  $10^{\circ}$  to  $12^{\circ}$  north of east. They move twenty-eight to thirty miles per hour.
7. Origin. (a) Local unequal heating; an eddying movement is assumed by the effect of the earth's rotation; this is right-handed. (b) Whirls at the margin of wind belts.
8. How are cyclones maintained? By release of lateral heat through condensation of moisture. The cyclones which reach Siberia die out from lack of moisture to keep them up.

b. Anticyclones. Outward moving whirls with high pressure within. Winds are usually not strong, but light and fluctuating. As the air settles it becomes under greater pressure and gets warmer, and clear skies generally accompany these storms. As the deflective influence of the earth's rotation is toward the right hand, an outward spiral movement in this direction results. Dew and frost are most likely to occur when an anticyclone is over a place.

## c. Hurricanes.

1. Compare with cyclones. Smaller than cyclones; often shorter lived, but often they come northward and become cyclones. Winds are blowing much more violently toward the center, and pressure is much lower than in cyclones; usually the rate is eight to ten miles an hour. At the center is a clear sky, "the eye of the storm."
2. Kind of movement. Inflow at the surface; ascent at the center; outward flow above.
3. Occurrence of. Usually six to ten miles of the equator; the deflective influence of the earth's rotation not great enough nearer the equator. They are unknown in the South Atlantic because there are no islands there.

H. General circulation of the atmosphere—*continued*:

## 7. Results of interference with the general circulation.

## c. Hurricanes.

4. Time of occurrence. Midsummer, in the West Indies—July to October; they never start over the continents, but always over oceans. The air over islands becomes heated and whirls start.
5. Direction. A storm starting in the southern part of the North Atlantic would move northwest, due to the influence of the trades moving southward and the upper winds. Presently it would come within the influence of the westerlies and move northeast. Hurricanes occasionally start in the islands south of India. These start west, are deflected southward, and, in the region of the antitrades, are changed to the southeast.

## d. Tornadoes.

1. What? A cyclone of small diameter, high gradient, and circular motion.
2. When? In the late afternoon in the late spring and summer.
3. Size? About twenty-five miles by one-fourth mile.
4. Movement. Northeast in the southeast part of a cyclone area; velocity, 35 to 40 miles per hour. The air circulation is the same as in a cyclone; a funnel-shaped cloud. As the whirl goes on it increases in violence and the dew-point may be reached at lower and lower levels, and hence the funnel grows downward.
5. Destruction. Buildings in the center have air under greater pressure than that outside, and hence walls are blown out. Buildings farther from the center are blown down by the whirl.
6. Causes of tornadoes. The wind in the southeast quadrant of a cyclone comes from the southwest and is warm. Cooler air comes into the warm area from the northwest. There will then be cool dry air over warm air—a very unstable condition, which causes a whirl.

## e. Cloudbursts.

1. What? Local. Very rapid condensation, of short duration.
2. Cause? Rapid condensation kept up by upward currents over low-pressure areas; when currents cease water falls.
3. Where? In dry regions.

H. General circulation of the atmosphere—*continued*:

## 7. Results of interference with the general circulation.

*f.* Periodic winds.

1. Monsoons.
2. Land and sea breezes.
3. Mountain valley breezes.

*g.* Miscellaneous winds.

1. Hot winds associated with cyclones.
2. Cold winds associated with anticyclones.
3. Chinook winds. Winds from the Pacific blowing over the mountains lose their moisture and become heated on the east side, and blow as dry, warm winds. They are important east of the mountains to the north and to the south of the United States. They make much land valuable which would otherwise be valueless.

*h.* Effects of winds.

1. Distribution of temperature.
2. Distribution of moisture.

## 8. Climate.

*a.* What? The average meteorological conditions of an area for a long time.*b.* Elements?

1. Temperature.
2. Wind.
3. Moisture.

*c.* Factors affecting climate.

1. Nearness to sea.
2. Latitude.
3. Altitude.
4. Winds.
5. Topographic relations.

*d.* Climate zones—bases for?

1. Mathematical—latitude.
2. Isotherms.
3. Moisture.
4. Winds. The best basis is the one which brings together those places which have most uniform conditions. Probably winds form the best basis in use.

*e.* Divisions of climate in the north temperate zone.

1. Moist and dry.
2. Equable and variable.
3. Interior and coastal.
4. Low and high altitudes.

H. General circulation of the atmosphere—*continued*:

## 8. Climate.

*f.* Weather.

1. What? Weather signifies meteorological conditions of a limited period.
2. Maps. Weather maps are made at eight A. M., Washington time. Observations are made at 165 stations in the United States, twenty in Canada, and four or five in the West Indies. Reports are sent to all stations, and maps are made showing temperature, pressure, direction of winds, changes in the last twenty-four hours, giving isothermal and isobaric charts.
3. Value of weather maps. (a) To sailors: Valuable cargoes are often kept in the harbor, owing to the warning. (b) To railroads: All freights leaving Pittsburg, west, are made up on the basis of Cox's forecast. Trains are made up in winter in three classes, heavy, medium, light, according to the amount of snow on the track. (c) To fruit shippers: Three million dollars' worth of fruit saved one winter because of forecast of cold wave.

## OCEANS.

## REFERENCES.

1. Gilbert and Brigham, Physical Geography, pp. 279-301.
2. Davis, Physical Geography, pp. 57-90.
3. Chamberlin and Salisbury, Geologic Processes, pp. 309-374.
4. Thompson, Voyage of the "Challenger," 2 vols.
5. Thompson, Depth of the Sea.
6. Barker, Deep Sea Soundings.
7. Wyld, Thalassa.
8. Shaler, Sea and Land.

## A. Distribution.

## B. Depth.

## C. Topography of the bed.

1. Very flat; on the land, degradation is more important than aggradation; in the ocean, aggradation is more important than degradation.
2. Some irregularities; *e. g.*, volcanic islands, coral islands, deeps or antiplateaus, cliffs which are perhaps fault scarps, *e. g.*, in the Mediterranean the water deepens 1500 feet very suddenly. The continental shelves are much more irregular; they have been from time to time above water, and have been eroded.

## D. Life.

- E. Composition. Every 100 parts of sea-water contain about 3.44 parts by weight of mineral matter in solution. The principal acids, solids and bases are shown in the following table (see C. and S., p. 309):

Chlorid of sodium.....	77.758
Chlorid of magnesium.....	10.878
Sulfate of magnesium.....	4.737
Sulfate of lime.....	3.600
Sulfate of potash.....	2.465
Bromid of magnesium.....	.217
Carbonate of calcium.....	.345

100

## F. Movements.

### 1. Causes of—

#### a. Unequal densities due to—

1. Unequal temperatures.
2. Unequal pressures.
3. Unequal salinity.

#### b. Winds.

#### c. Attraction of sun and moon.

#### d. Earthquakes, volcanoes, landslides.

#### e. Differences of level of the surface; *e. g.*, higher off river mouths and lower where evaporation is great.

### 2. Classes of movement.

#### a. Waves.

#### b. Currents.

#### c. Tides.

##### 1. Cause of.

2. Variation in the height of tides at the same place:
  - (a) Seasonal—yearly; perihelion—tides greater; aphelion—tides less.
  - (b) Conjunction of moon and sun bimonthly.
  - (c) Daily.
  - (d) Monthly.

#### d. Drift. All ill-defined slow currents. (The Gulf stream becomes a drift current in the North Atlantic.)

#### e. Creep. May be vertical or horizontal.

## G. Temperature.

### 1. Horizontal variation in the Red sea from 90° to 28° F.

#### a. Cause of—

1. Latitude.
2. Currents.
3. Winds.
4. Distribution of land.
5. Storms.

### 2. Vertical variation.

## H. Deposits at the bottom.

### 1. Deep sea—mud, ooze, etc.

### 2. Shallow water—muds, sands, gravel, etc.

## OUTLINE OF WORK ON LAND.

- A. Agents modifying land.
  - 1. Gradational agents.
    - a. Agents of weathering.
    - b. Ground-water.
    - c. Streams.
    - d. Wind.
    - e. Shore-lines.
    - f. Glaciers.
    - g. Lakes.
  - 2. Vulcanism and diastropism.
    - a. Volcanoes.
    - b. Earthquakes.
    - c. Changes of level.
- B. The great topographic forms.
  - 1. Plains and plateaus.
  - 2. Mountains.

## WEATHERING.

## REFERENCES.

- 1. Davis, pp. 99-103; 263-275.
- 2. Mill, §§310-313.
- 3. Chamberlin and Salisbury, vol. I, ch. 2; also 105-109.

- A. General notion of.
- B. Agents of disintegration in weathering; discussion of this work.
  - 1. Solution. Note very briefly the other sorts of work done, or aided, by water: Hydration, carbonation, oxidation.
  - 2. Changes of temperature.
    - a. Not involving freezing-point. How disruption is affected; where the process is important.
    - b. Involving freezing-point. Small film of water in freezing in crack exerts pressure of 150 tons per square foot; where and when most important.
      - 1. In various latitudes and climates.
      - 2. In various seasons.
      - 3. At frost line on mountains.
  - 3. Plants and animals.
    - a. Root splitting.
      - 1. Lichens: Have destroyed fine polish on granite in a single night.
      - 2. Ants: In Massachusetts they bring one-fourth inch of fine soil to surface per year. (Shaler.)
      - 3. Earthworms: In England they bring ten tons per acre per year to the surface.
  - 4. Beating of rain.
  - 5. Gravity.
  - 6. Wind (discuss briefly here).

**C. Rate of weathering.**

1. Character of rock undergoing change.
2. Climate.
3. Rate of removal of waste.

**D. Relation of weathering to erosion. Weathering is preparation for transportation.**

**E. Results of weathering.**

1. Formation of rock mantle.
  - a.* Discuss transition from soil to subsoil; to rock.
  - b.* Thickness of soil dependent on—
    1. Rate of formation.
    2. Rate of removal.
  - c.* Some examples of thickness: 300 feet in Brazil; 50 feet to 100 feet in some of Southern states.
  - d.* Does absence of soil mean that none is being formed? Kind of soil at any given place? Soils and man.

**F. Topographic results.**

1. Talus piles.
2. Serrate topography of high altitudes.
3. Columns, boulders of disintegration, etc., due to differential weathering.

## GROUND-WATER.

### REFERENCES.

1. Davis, pp. 224-230.
2. Mill, §§ 313-317.
3. Chamberlin and Salisbury, vol. I, ch. 4.

**A. Facts about.**

1. Facts of existence of ground-water. How shown?
2. Source of. Reasons for believing rainfall chief source.
3. What determines amount of rain-water which enters ground?
  - a.* Porosity of soil.
  - b.* Slope.
  - c.* Climate.
  - d.* Rate of precipitation.
4. The level of ground-water.
5. Is level of ground-water constant? How known. Factors determining position of water-table.
6. Form of water surface. Gravity alone would tend to give it what form? Does water-table ever come above surface?
7. Depth to which ground-water goes. How limited is descent?
8. Amount of ground-water.

**B. Work of ground-water.**

## 1. Mechanical.

## 2. Chemical.

a. Solution. Can all waters dissolve? Solvent power varies with—

1. Heat (gypsum most soluble at 38°C.)

2. Pressure.

3. Content.

b. Deposition. Due to—

1. Change of temperature.

2. Evaporation.

3. Change of pressure.

4. Mingling of solutions.

5. Plants.

c. Types of change brought about.

1. Subtraction; rock disintegration.

2. Substitution; petrification.

3. Addition; rock cementation; veins.

4. New combinations.

**C. Results of work of ground-water.**

1. In weathering—already discussed.

2. Caves and cave deposits.

3. Sinks.

4. Natural bridges.

5. Creep, slump, and landslides.

**D. Springs.**

1. Notion of.

2. Types of—

a. Hillside spring.

b. Fissure spring.

c. Artesian Wells. Conditions of formation. Examples:  
Along the Atlantic coastal plain; in the Great Plains region.

d. Geysers.

1. What?

2. Where?

3. Phenomena of eruption.

4. Cause of eruption and steam.

5. Fate of geysers.

6. Deposits about geysers.

## STREAM WORK.

See Chamberlin and Salisbury, vol. I, ch. 3.

I.—*Development of a Valley.*

See Wisconsin Survey Bulletin No. 5, ch. III.

- A. Take hypothetical case of newly emerged coastal plain with uniform seaward slope.
  - 1. Conditions for sheet erosion without valleys.
  - 2. Concentration of run-off. How secured. Results.
    - a. Single slight depression near and at right angles to shore.
  - 3. Growth of gully in three dimensions: gully-hood to ravine-hood to valley-hood.
  - 4. Direction of headward growth.
  - 5. How the valley gets a stream.
  - 6. Intermittent and permanent streams. Interrupted valley growth in early life; uninterrupted growth later.
  - 7. Tributaries.
  - 8. The volume of the stream; conditions determining climate gradient.
  - 9. Velocity of stream; conditions determining.
  - 10. The work the stream does.
    - a. Transportation.
    - b. Corrasion.
    - c. Deposition.

II.—*Transportation by Streams.*

See Chamberlin and Salisbury, vol. I, pp. 109-113.

- A. How the stream gets its load.
  - 1. Wears or dissolves it from bed or sides of channel.
  - 2. Receives it from—
    - a. Tributaries.
    - b. Side slopes; delivered by wash or gravity.
    - c. Wind.
- B. How the load is carried.
  - 1. Mechanically.
    - a. Rolled down bottom.
    - b. In suspension. How accomplished? A particle dropped again and again.
  - 2. In solution.
- C. Velocity and transporting power; development of law.
  - 1. Dependent on velocity.
  - 2. Velocity depends on what?

- D. Some examples of amount of material transported by streams.
1. Mechanically. The Mississippi takes into Gulf each year enough solid sediment to cover one square mile to a depth of 268 feet.
  2. In solution. "Annual discharge of Thames past Kingston (few miles above London) is estimated at 548,230 tons of dissolved mineral matter, two-thirds of which is carbonate of lime." "Rivers of England and Wales carry each year to the sea 8,370,630 tons of solid in solution." "Rhône carries past Avignon 8,290,464 tons of dissolved salts per year." (Geikie, Phys. Geog. 281.) "Thames takes past Kingston 1502 tons per day." (Huxley, Phys., p. 126; see C. and S., Geol., p. 103.)

### III.—Corrasion of Streams.

See Chamberlin and Salisbury, pp. 113-116.

- A. Practical inability of clear water to corrade. Case of Niagara river.
- B. The tools of the stream.
- C. Rate of corrasion. Discuss as the chief determinants, the influence of—
  1. The character of the rock.
    - a. Hardness.
    - b. Structure. Consider:
      1. Stratified *versus* massive rocks.
      2. Horizontal *versus* inclined beds.
      3. Inclined beds, the stream flowing (a) with dip, (b) against dip, (c) with strike.
    - c. Chemical composition. Solubility.
  2. Velocity of stream.
  3. Load.
    - a. Amount.
    - b. Character; as shape and hardness.
  4. Stream subject to great and sudden fluctuations *versus* one of nearly constant volume.

### IV.—Erosion Cycle; its Stages.

See Chamberlin and Salisbury, vol. I, pp. 75-87.

- A. Land surface unaffected by streams. Its erosion history un-begun.
- B. Topographic youth.
  1. Surface affected by narrow, steep-sided valleys. Lakes and falls often present. (These to be discussed later.)
  2. Flats are at this stage the inner stream uplands.
  3. Narrowing of intervalley uplands.
    - a. Wash on valley sides.
    - b. General weathering processes on slopes.
    - c. Tributaries.

## C. Topographic maturity.

1. Characteristics: Maximum of slope and run-off; hill and valley country. Many more streams than in youth; country completely dissected by erosion lines.
2. Consider influence upon topography at this stage of—
  - a. General altitude of region and nearness to the sea.
  - b. Rock structure; horizontal *versus* folded beds.

## D. Topographic old age.

1. Characteristics: Shallow, wide-open valleys. Low, rolling interstream areas. Sluggish, meandering rivers.

## E. Final development of—

1. Pene-plain.
2. Base-level plain. (This accomplished first near the sea.)

## F. The term "cycle of erosion."

*Note.*—Read Davis on "Young, Mature and Old Rivers." While young, mature and old topographies are being discussed, it will be well to introduce "Cross-sections and Profiles." (See "Laboratory Material.")

V.—*Special Features Resulting from Special Conditions of Erosion.*

## A. Bad-lands topography.

1. Conditions for—
  - a. Considerable altitude.
  - b. Unindurated rocks.
  - c. Generally arid climate, with marked concentration of what rain is received.
  - d. Absence of vegetation.
  - e. Horizontal strata for best development.
2. Developed in early mature stage of erosion.
3. Where formed?

## B. Canyons.

1. Notion of.
2. Conditions for—
  - a. Considerable altitude.
  - b. Dry climate.
  - c. Running water.
  - d. Such a condition of the rocks as will permit their standing in steep walls.

## C. Rapids and falls. (These and the following features result primarily from inequalities of hardness.)

1. General conditions for.
2. Discuss with diagrams, using horizontal strata, the possible change from rapid to falls to rapids. Consider possibilities with inclined strata.
3. Other ways in which falls may develop.
  - a. Over fault scarps—Colorado.

C. Rapids and falls—*continued*:

3. Other ways in which falls may develop.
  - b. When forced to take new course—Niagara.
  - c. When streams overflow lava—dams.
  - d. Hanging valleys.

## D. Narrows.

1. Determining conditions.
2. Erosion stage at which conspicuous.

## E. Elevation due to differential erosion.

1. Mesas.
2. Buttes.
3. Hogbacks.
4. Monadnocks.
5. Plugs, dike ridges, etc.

## F. Natural bridges.

1. Developed in connection with waterfalls.
2. Developed from caverns.

VI.—*Stream Piracy and Adjustment.*

## A. Piracy.

1. What?
2. How accomplished? Captor has advantage of deeper valley, due to inequalities of volume, load, or hardness.
3. Examples. (See "Laboratory Material.")

## B. Stream adjustment.

1. What it means.
  - a. Most common in region of folded strata.

VII.—*Effects of Changes of Level.*

## A. Uplift.

1. Equal rise everywhere, coast in same position. Resulting terraces. Resulting longitudinal profile.
2. Entrenched meanders.
3. Lengthwise and crosswise valleys.
4. Pene-plain levels.

## B. Subsidence.

1. Drowned valleys.
  - a. All parts of basin sinking equally.
  - b. Basin sinking unequally.

VIII.—*Stream Aggradation.*

## A. Why a stream deposits. When overloaded due to—

1. Decrease in gradient.
2. Decrease in amount of water, due to evaporation, absorption.

- A. Why a stream deposits—*continued*:
  3. Change in shape of channel.
  4. Overloaded by tributaries.
  5. Change in character of material.
  6. Checking of current in flowing into body of standing water.
- B. Places of chief deposit by rivers.
  1. At base of steep slopes in its upper course. In case of great rivers, this is where they leave the mountains and enter plains.
  2. On flood-plains.
  3. At the debouchure.
- C. Topographic features due to stream deposition.
  1. Cones and fans.
  2. Flood-plain features.
    - a. What is a flood-plain?
    - b. The deposit over the flood-plain; natural levee.
    - c. Meandering of streams; oxbows.
    - d. Size of some flood-plains: Mississippi, 50,000 square miles, and average thickness of alluvium, fifty feet.
  3. Deltas.
    - a. How formed.
    - b. Distribution of deltas.
    - c. Why do not all streams have deltas?
    - d. Rate of growth.
      1. Determinants. Some examples: Mississippi, one inch in sixteen years: Po—Adria, once on the seashore, is now fourteen miles inland.
    - e. Size of deltas.
      1. Ganges, 50,000 square miles.
      2. Mississippi, 12,000 square miles.
  4. Terraces.
    - a. What?
    - b. How formed? They result from—
      1. Uplift of basin.
      2. Removal of obstruction.
      3. Normal progress of valley development.
      4. Withdrawal of excess of load.

## WORK OF THE WIND.

See Chamberlin and Salisbury, pp. 20-39.

- A. Transportation.
  1. How it gets its material.
    - a. Picks it up.
    - b. Extraterrestrial.
    - c. From volcanoes.

A. Transportation—*continued*:

2. How kept in suspension.
  - a. Upward currents.
  - b. By friction of air.
3. Distance to which material is carried.
4. Transportation of dust important wherever—
 

<ol style="list-style-type: none"> <li>a. Strong wind.</li> <li>b. Dry surface.</li> <li>c. Lack of vegetation.</li> <li>d. Earthy matter.</li> </ol>	}	Sage-brush plains.
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## B. Erosion—abrasion.

1. How?
2. Where an important agent of erosion? “In eastern Sahara wide areas of rocky land have been leveled.”
3. Topographic results.
  - a. Toadstool effects.
  - b. Etching out of soft rock.
  - c. Polishing and shaping of stones.

## C. Deposition.

1. Dunes.
  - a. What?
  - b. Where? Wherever dry sand is exposed to the wind.
    1. Shores.
    2. Dry valleys.
    3. Deserts.
  - c. How formed? (See Chamberlin and Salisbury, vol. I, p. 24.)
  - d. Height of dunes, 200 to 300 feet; 10 to 20 feet commonly.
    1. Strength of wind.
    2. Supply of material.
    3. Size of grains.
  - e. Migration of dunes.
    1. How accomplished.
    2. Examples (see Chamberlin and Salisbury, p. 32): (a) Burial of orchard in New Jersey; (b) church in Germany—1800, 1839, 1869.
    3. How stopped. (Between 1826 and 1838 the government spent \$28,000 to fasten dunes on harbor shores of Provincetown, Mass., by beach grass.)
2. Loess (see Chamberlin and Salisbury, p. 22).
  - a. Description; physical character.
  - b. Where found. China: Source; thickness, 1000 feet. Europe. United States.
  - c. Origin: Wind; sediment of smaller rivers of glacial period.

SHORE-LINES.

See Chamberlin and Salisbury, pp. 326-351.

A. Facts of shore-lines horizontally considered.

1 Regular.

a. Straight.

b. Curved.

2. Irregular. Types of irregularity.

a. Reentrance of water.

1. Large—Hudson bay, etc.

2. Small—Delaware bay, etc.

b. Projection of land.

1. Parallel to the general trend.

2. Normal to the general trend.

c. Distribution of—

1. By continents.

2. In latitude.

3. With reference to relief of land.

B. As they are vertically considered.

1. Low, more often regular, in vertical sense.

2. High, more often irregular, in vertical sense.

C. Forces at work upon shore-lines.

1. Diastrophism.

a. Uplift.

b. Subsidence.

2. Gradation.

a. Degradation.

b. Aggradation.

Both phases of work done by winds, rivers, waves  
and littoral currents, currents (ocean), glaciers,  
shore ice.

3. Vulcanism.

a. Constructive.

b. Protective.

4. Above forces usually work in combination of some kind.

D. Conditions affecting the operation of forces.

1. Strength of waves.

a. Determinants.

1. Strength of wind.

2. Depth of water.

3. Expanse of water.

D. Conditions affecting the operation of forces—*continued*:

## 1. Strength of waves.

- b. Examples: Storm waves beat on Outer Hebrides with force equal to pressure of three tons per square foot. In Shetland islands waves have torn up masses of rock  $8\frac{1}{2}$  tons in weight and heaped them together at a height of 62 feet above high-water mark. Other blocks "quarried out" at levels from 70 to 74 feet above sea.

## 2. Concentration of blows. Determined by angle of incidence.

## 3. Resistance of rock.

## a. Hardness of.

## b. Structure of. Consider—

- 1. Horizontal beds.
- 2. Beds dipping seaward.
- 3. Much- *versus* little-jointed rocks.

## 4. Accessories:

- a. Clear waves ineffective against hard rock; shown by barnacles being as numerous after as before great storms of Outer Hebrides.

## b. Work done by aid of—

- 1. Rock fragments.
- 2. Air. In cliffs with cracks and joints, waves drive air with prodigious force; its contraction and expansion a powerful agent.
- 3. Ice.

## E. Shore-line features, resulting from above.

## 1. Initial forces resulting from diastrophism.

- a. Uplift—gives regular, simple shore-line.
- b. Subsidence—produces irregular, embayed coast.

## 2. The cliff.

- a. Its formation. (See C. and S.)
- b. Declivity of cliff depends on?
- c. The wave-cut terrace.
- d. The wave-cut and built terrace.
- e. Example of rate of retreat of land: Six feet in one year on Nantucket.

## 3. The beach of transportation. Develop idea of littoral current.

## a. Origin of shore drift.

- 1. From cliffs.
- 2. From rivers.

## 4. Depositional forms.

## a. Current holds its direction and shore-line during—

- 1. Spit.
- 2. Hook.
- 3. Bar.
- 4. Loop.

## b. Barrier on shelving coast.

- F. Stages in coast-line development.
- G. Application of foregoing to coasts, especially of North America.  
References:

1. Topographic Atlas of United States, folio 1.
  - a. Fiord coast.
  - b. A barrier-beach coast.
2. United States Geological Survey, Monograph I, ch. II.

## PRESENT GLACIERS.

### REFERENCES.

1. Chamberlin and Salisbury, ch. 5, esp. pp. 238-253 and 268-286.
2. New Jersey Survey, vol. V, ch. 3, esp. pp. 68-76.
3. Wisconsin Survey, Bulletin V, ch. 5, esp. pp. 73-105.

### A. Facts about.

1. What?
2. Under what conditions formed?
  - a. Where do these conditions obtain?
  - b. Snow-line and its position in tropics; in other latitudes—8800 feet in Switzerland.
3. Transformation of snow into ice. *Névé*.
4. Movement of glaciers.
  - a. Fact of.
  - b. Controlling conditions.
  - c. Differential movement.
    1. Mer de Glace, in summer 27 inches in center and 19 inches near sides.
  - d. Examples of rate: Swiss glaciers, 1 to 3 inches or 4 inches per day. Greenland, average of edge, 1 inch per week; locally, 50 to 60 feet per day.
5. Lower limit.
  - a. How determined?
  - b. Where, with reference to snow-line? In Switzerland, 3500 feet below (average). Within 670 feet of sea-level in case of one New Zealand glacier.
  - c. Oscillation of end.
    1. Causes.
    2. Examples: Alaska retreating; some Norwegian retreating, some advancing; 35- to 40-year cycle in Switzerland.
6. Surface features; irregularity.
  - a. Due to debris.
  - b. Due to unequal melting following cracking.
  - c. Change in slope.

### B. Types of glaciers.

1. Ice caps.
  - a. Greenland, 300,000 to 400,000 square miles.
  - b. Antarctic, 3,000,000 square miles.

B. Types of glaciers—*continued*:

2. Valley glaciers.
  - a. Alpine type.
  - b. High-latitude type.
3. Piedmont glaciers.
4. Cliff glaciers.

## C. Work of glaciers.

1. Kinds of work done.
  - a. Transportation.
    1. How load is obtained.
    2. Transportation by ice *versus* by rivers. Moraines: Lateral, medial, and ground.
  - b. Erosion.
    1. Tools.
    2. Characteristics of surfaces and rocks worn.
  - c. Deposition.
 

Ice deposits *versus* water deposits. Moraine; terminal.
2. Topographic effects.
  - a. Shaping of hills; Roche Moutonnée.
  - b. V- to U-shaped valleys.
  - c. Hanging valleys.
  - d. Fjords.
  - e. Rock basins, at slopes of mountains, etc.
  - f. Depositional features. (Perhaps only terminal moraines should be mentioned here. Others to be discussed in connection with American ice-sheet.)

## PAST GLACIERS.

See Davis, pp. 330-346.

## A. General discussion of glacial period.

1. Centers of dispersal.
2. Extent of glaciated area.
3. The glacial period complex; several advances of the ice. Five epochs known.
4. Driftless area.
5. Cause of glacial climate.
6. Time relations. Time since last much shorter than time between first and last.

## B. Drift deposits.

1. Unstratified.
  - a. Moraines.
    1. Ground.
    2. Terminal: Where formed? Characteristics.
  - b. Drumlins.

B. Drift deposits—*continued*:

## 2. Stratified.

- a. Kames.
- b. Eskers.
- c. Outwash plains.
- d. Valley trains.

## C. Geographic effects.

## 1. Reduce slopes.

- a. Effect on transportation.
- b. Increased arable land.

## 2. Modification of soil.

- a. Amount increased.
- b. Physically mixed.

## 3. Drainage.

## a. Lakes and marshes.

1. Lakes, how formed. Marginal lakes. The Great Lakes, due to (a) Wearing, eroding action of streams. (b) Uplifting and tilting of the land. (c) Glacier abrasion and obstruction by drift.

## b. Floods diminished.

## c. Water-power.

## 4. Change in acreage of land.

- a. Addition. Long Island covers bare rock.
- b. Subtraction. Lakes and marshes.

## D. Contrast between glaciated and non-glaciated areas.

1. Topography—in unglaciated, elevations stand in definite relations to drainage lines.
2. Drainage—driftless well drained; in drift area, lakes, marshes, and undrained depressions.
3. Mantle rock.
  - a. Thicker in drift.
  - b. Physically diverse.
  - c. Contact with under rock.

## LAKES.

See Chamberlin and Salisbury, pp. 368-374.

## A. Origin of basins.

## 1. Due to crustal movements.

- a. Depressions are new land surfaces: Southern Florida.
- b. In mountains: Block mountain region of Oregon.
- c. Warped valleys.
- d. Earthquakes: "Sunken country"; Reelfoot lake, Tenn.

A. Origin of basins—*continued*:

## 2. Formed by river action.

a. Oxbows.

b. Delta lakes: Ponchartrain.

c. Damming by fan: Tulare; Pepin.

d. Rapid aggradation by main—ponding back of tributaries: Red river, Louisiana.

## 3. Accidents to rivers. Damming by—

a. Lava flow.

b. Drift: Finger lakes.

c. Landslides.

## 4. Formed by glaciers.

a. See 3: b, above.

b. Irregular deposition of drift.

c. Rock basins; ice erosion. Canada, Finland, and western mountains.

d. Marginal lakes: Agassiz, etc.

## 5. Due to waves and currents; back of bars.

## 6. Due to work of ground-water. Ponds in sinks.

## 7. Due to volcanic action.

a. See 3: a, above.

b. In caldrons. Crater lakes.

## B. Life-history: Short-lived—

1. Filling.

2. Cutting down of outlet.

3. Work of vegetation.

4. Evaporation.

## C. Salt lakes.

1. Conditions of formation.

2. Where?

3. Deposition.

## D. Relation to man.

1. Great area lost to agriculture.

2. Fertility of old lake floors. (Wheat region of Red River country.)

3. Prevent destructive floods.

4. Great Lakes and development of north-central United States.

## VOLCANOES.

A. Definition of: "Restricted vent, out of which hot rock material comes."—*Salisbury*.

## 1. Essential points.

a. Vent.

b. Discharge of hot rock.

## B. Facts about.

1. Types of eruption.
  - a. Violent.
  - b. Quiet.
2. Degrees of activity.
  - a. Active.
  - b. Dormant.
  - c. Extinct.
3. Products.
  - a. Lava : "Mineral matter dissolved in mineral matter," not merely liquid rock. "Water with mineral matter in solution grades insensibly into lava."
  - b. Cinders (scoria).
  - c. Ashes.
  - d. Vapors and gases. ( $\text{H}_2\text{S}$ ,  $\text{H}_2\text{O}$ ,  $\text{CO}_2$ ,  $\text{SO}_2$ ,  $\text{HCl}$ ,  $\text{Cl}$ ,  $\text{S}$ . Many others in very small amounts.)
4. Relations of adjacent vents.
  - a. In activity.
  - b. In height of lava.
  - c. In kinds of material discharged: Vesuvius, Krakatoa, Mauna Loa, Stromboli.
5. General phenomena.
6. Destructiveness.
  - a. Lava-flows.
  - b. Ashes, cinders.
  - c. Torrents.
  - d. Earthquakes.
  - e. Landslides.
7. Topographic results.
  - a. Cones :
    1. Cinder cones : Mauna Loa; diameter 25 times height.
    2. Lava cones : Mount Shasta; diameter 7 times height.
  - b. Plateaus.
8. Number: 300 active; very many cones not yet eroded away.
9. Distribution :
  - a. Continents *versus* islands; one-third of present volcanoes on continents.
  - b. Nearness to sea.
  - c. Latitude.
  - d. In belts or lines.
  - e. Mountains.
  - f. Moving land.
  - g. Young strata.

B. Facts about—*continued*:

## 10. Physical character.

- a. How stream moves.
- b. Section from top to bottom.
- c. Porphyry, glass, etc. Basaltic structure. Tuff.

## C. Volcanoes in past time. No known law governing distribution in time. Periods of greater and lesser energy and number.

## D. Eruptions and irruptions not volcanoes proper.

1. Lava fields.
2. Laccoliths.
3. Sills.
4. Dikes.

## E. Cause of volcanoes.

## 1. Things to account for.

## a. Heat. Probably 3000° F. at surface.

## 1. Primal; four theories.

- (a) "Thin crust theory."
- (b) This theory postulates.
- (c) That the earth is solid except for "localized enclosures of molten matter" at various depths from the surface.
- (d) Postulates that earth is solid throughout, but that rocks at some little distance from the surface are in a "potentially liquid state," kept solid only by the enormous pressure to which they are subjected.

## 2. Secondary.

## (a) Chemical theory.

## b. Force.

1. Steam and other gases.
2. Gravity.
3. Lateral pressure.

## F. Life-history of volcanoes. (See "Volcanoes of North America," by Russell.)

## G. Notes on ejecta:

## 1. Types of texture in igneous rocks:

- (a) Glassy; (b) compact; (c) porphyritic;
- (d) granitoid; (e) pyroclastic.

See Scott's Geology, pp. 189-191.

**EARTHQUAKES.**

See Chamberlin and Salisbury, pp. 503-512.

- A. What? Tremors of appreciable violence, springing from sources within the earth itself.
- B. Where?
- C. Frequency. Japan, three or four per day. "Crust of earth is in a perpetual tremor."
- D. Phenomena of earthquakes.
  - 1. Series of elastic waves, spherical.
  - 2. Amount of actual movement. Fraction of millimeter.
  - 3. Rate of propagation of wave.
    - a. Determining conditions. Elasticity and continuity of rock.
    - b. Estimated rate. "Several hundreds to several thousands of feet per second at the surface."
  - 4. Depth affected.
    - a. How position of flows is estimated.
    - b. Most originate within 5 to 10 miles of surface.
- E. Causes of earthquakes.
  - 1. Fissuring.
  - 2. Faulting.
  - 3. Volcanic explosions.
  - 4. Avalanches.
  - 5. Falling in of caverns.
  - 6. Slipping of material on steep submarine slopes.
    - a. On continental shelves (Japan).
    - b. On delta front.
- F. Effects of earthquakes.
  - 1. Open up great cracks: India, New Zealand, Japan.
  - 2. Faults: Owen's valley, Cal., 1872; throw, 20 feet.
    - a. Permanent changes of level: Chili, 1822; rose 3 to 4 feet for long distance. Off Greece, submarine fault scarp of 1500 feet.
  - 3. Form permanent depressions in which lakes sometimes accumulate. Sunken country. (These sometimes circular: Charleston.)
  - 4. Landslides sometimes dam valleys.
  - 5. Effect on drainage. Destroy and make springs.
  - 6. If shock is in sea, sea waves.
  - 7. Great loss of life: Lisbon, 1755, 60,000; Calabria, 1783, 40,000

## CHANGES OF LEVEL.

- A. Method by which any change in relative position of land may be detected. Comparison with sea.
- B. Change in relative altitude of land and sea may be due to—
  - 1. Change in position of land.
  - 2. Change in sea.Can it be told which has occurred?
- C. Elevation, proofs of.
  - 1. Testimony of human erections: Bridges above water in south and west Crete; temple of Serapis; marks on Swedish coast.
  - 2. Elevated beaches, sea cliffs, etc.: Parts of southern California; east and west coast of Scotland.
  - 3. Marine shells.
  - 4. Regular, simple shore-line.
- D. Depression, proof of.
  - 1. Submerged human erections: Drowned buildings in east of Crete; drowned buildings in Greenland.
  - 2. Buried forests.
  - 3. Drowned valleys: Hudson.
  - 4. Coral reefs and atolls.
- E. Evidences of movement away from seacoast.
  - 1. Tilted old beach lines: Iroquois beach, 140 feet above Lake Ontario at Lewiston; 200 to 300 feet near Watertown.
  - 2. Some terraces.
  - 3. Interrupted profiles.
  - 4. Entrenched meanders.

## The Great Types of Land Surface.

### PLAIN AND PLATEAU.

- A. The great types of land surface.
- B. Notion of plain, plateau, and mountain.
- C. Types of plains.
  - 1. Large *versus* small.
  - 2. Flat *versus* rolling.
  - 3. High *versus* low.
  - 4. Fertile *versus* infertile.
  - 5. Moist *versus* dry.
  - 6. Treeless *versus* forested.
  - 7. Along coast *versus* away from coast.
    - a. Around lakes.
    - b. Between mountains.
    - c. Along rivers.
- D. Different kinds considered.
  - 1. Coastal plain (Atlantic coastal plain).
    - a. Origin.
    - b. Soil belts.
    - c. Fall line.
  - 2. River plains.
    - a. Due to gradation (Marysville Butte maps).
    - b. Due to lateral plantation (Elk Point, Mont., map).
  - 3. Lake plains.
    - a. Around lakes.
    - b. Old lake floors (Sierraville, Cal.; Fargo, N. Dak.)
  - 4. Waste plains.
  - 5. Glacial plains.
    - a. Recently glaciated (Madison sheet, Wisconsin).
    - b. More remotely glaciated (Marion sheet, Iowa).
  - 6. Lava plains.
- E. Life-history of plains.
- F. Plateaus.
  - 1. Points of likeness
  - 2. Points of difference } between plateaus and plains.
  - a. Plateau valleys *versus* plain valleys.
  - b. Cliffs characteristic of plateaus.

F. Plateaus—*continued*:

3. Stages in plateau development.
  - a. Enforce notion that there is no such thing as "old plateau."
  - b. Effect on topography of streams. Immediate; final.
  - c. Plateau remnants—mesas and buttes.
4. Man and plateaus.

## MOUNTAINS.

## A. Mountains in general.

1. Definition.
2. Division (Le Conte).
  - a. System: "Complex of more or less parallel ranges, born at different times." (North American Cordilleras.)
  - b. Range: "A single mountain individual produced by an earth throw." (Sierra, Wahsatch, Uinta, etc. Appalachian.)
  - c. Ridge: Subordinate part of range, formed—
    1. By separate folds formed at the same time. Parallel folds of Java range.
    2. By faulting.
    3. By erosion.

## B. Kinds.

1. Block (fault)—Oregon.
2. Folded—Juras.
3. Domed—Black Hills.
4. Volcanic
 

{	Massive igneous core—Pike's Peak.
{	Trap ridges—Tom; Holyoke.
5. Circumdenudation.

## C. Discussion of (each of above).

1. Origin.
2. Life-history: Youth, maturity, old age.

## D. Influence of mountains on—

1. Climate.
  - a. Elevation and temperature.
  - b. Effect of winds.
    1. Mountain and valley breezes (valley breeze, day; mountain, night).
    2. Chinook.
  - c. Rainfall: Two sides of Andes; valley of California *versus* Nevada; shore of Wales *versus* valley of Thames.
2. Economic wealth.
  - a. Fissuring.
  - b. Exposure of deep deposits by erosion.

D. Influence of mountains on—

3. Trade routes—Spain.
4. National boundaries: Eastern or western Europe; Chili and Argentine controversy.
5. Refuge for weak peoples: Highlands of Scotland; Switzerland.
6. Influence on history: Alps in early Europe; mountains of Greece; mountains of Italy.
7. Habits and customs of inhabitants: Language of Wales; customs of North Carolina mountaineers.
8. Dangers to inhabitants of.
  - a. Avalanches. (Forest protection of Switzerland.)
  - b. Landslides. (Valley of Ganges.)

E. Topographic maps.

1. Volcanoes.
  - a. Young: Lassen Peak sheet; Mount Taylor.
  - b. Older, various stages of demolition: Marysville; Shasta; San Francisco.
  - c. Plugs: Crazy mountains, in Little Belt and Livingston folios.
2. Igneous mountains. Massive igneous cores: Pike's Peak.
3. Trap ridges: Holyoke (folio.)
4. Folded mountains.
  - a. Stevenson, Ala. (folio.)
  - b. Kingston, Tenn. (folio.)
  - c. Harper's Ferry, Va. (folio, etc.)

*Differences in Erosion between High Altitudes and Low.*

F. Moisture.

1. Often drier—especially in lee of mountain.
2. Often wetter—especially on windward of mountain.
3. Differences in form of precipitation. (Mountain streams do their work primarily when snow melts.)
4. Differences in rate of precipitation.

G. Wind.

1. Much more effective in high altitudes.

H. Temperatures.

1. Greater range in higher altitudes.
2. Much lower average in high altitudes.

I. Differences in vegetation.

1. Protecting or failing to protect against erosion.

## SUGGESTIONS FOR LABORATORY AND FIELD WORK IN PHYSICAL GEOGRAPHY.

Laboratory and field work simply to supplement text and not an end in itself. Laboratory and field work to go hand and hand with text.

ROOM. Any light room fitted with flat-topped tables. Case or set of drawers to keep maps and specimens in. Maps best kept in folders of wrapping-paper.

METHODS. In map work divide class into groups of four. Have maps arranged in duplicate sets, giving one set to each group.

In field work divide into groups of 15 to 20. In all cases teacher must be thoroughly familiar with work before attempting to take class over ground.

RELATION OF FIELD AND LABORATORY WORK TO TEXT. Text three days, field and laboratory work two days, about right proportion. Four to six field trips a year generally sufficient.

TEXT WORK. Teach text thoroughly. Supplement and illustrate by talks and assigned readings when possible. Teacher should be thoroughly familiar with material equivalent to that contained in Salisbury's *Physiography* or Gilbert & Brigham, *Appleton*.

### *Good Reference Books for Teacher.*

Salisbury *Physiography*, Holt & Co.

Chamberlin and Salisbury, *Geology*, vol. I, Holt & Co.

Mill, *International Geography*, Appleton.

Ward, *Practical Exercises in Meteorology*, Ginn & Co.

Scott, *Introduction to Geology*.

Norton, *Introduction to Geology*.

Fairbanks, *Physiography*.

Brigham, *Laboratory Manual Physiography*, Appleton.

Thrafton, *Laboratory Manual Physiography*, Ginn & Co.

(Last five high-school texts, and may possibly be obtained as desk copies.)

### LABORATORY WORK.

#### Map work—

1. Teach meaning of topographic maps. Model may be used.  
 Draw ideal contour map, as of conical mountain, etc.  
 Draw profiles.  
 Examine maps showing mountains, plateaus, and plains.
2. Rivers or running water.
  - (a) Canyons illustrating downward cutting.  
 Meanders illustrating lateral cutting.
  - (b) Cycle—youth, maturity, old age.
  - (c) Deposition—deltas, bows, islands, alluvial fans, levees, formation of oxbows, flood-plains, terraces.
  - (d) Effect of unequal hardness of strata—ridges, hogbacks, mesas, buttes, escarpments.

Map work—*continued* :

3. Ground-water. Study general topography of limestone region.
4. Wind work—dunes, erosion (Nebraska).
5. Glaciers—existing.  
erosion—cirques, U valleys, roches moutonnes.  
deposition—moraines, kames, drumlins.
6. Plains—central, pene-plain, lacustrine, flood-plains, waste plains, glacial.
7. Plateaus—erosion, vulcanism, folded, faulted.  
Mountain.
8. Volcanoes—old, young, lava plain.
9. Coast-lines—erosion—sea cliffs, heads.  
deposition—beaches, bars, spits, hooks, loops,  
ponds, barrier beaches.  
diastrophism—old beach lines.

Identification of: Quartz, calcite, mica, feldspar, galena, gypsum, limestone, sandstone, shale, quartzite, igneous rock.

## METEOROLOGICAL.

## Observations of:

DATE.	Temp.	Pres- sure.	Wind.		Clouds.		Rain- fall.	Re- marks.
			Dir.	Vel.	Kind.	Amt.		
7-17-8 A. M. . . . .								
7-17-8 P. M. . . . .								
7-17-8 P. M. . . . .								

## Study of weather maps:

1. Plot annual mean temperature of United States.
2. Study relation of direction and strength of wind to isobars and quadrants of highs and lows.
3. Relations of isotherms and isobars, highs and lows. Cold wave.
4. Relation of humidity to highs and lows.
5. Direction and rate of movement of highs and lows.

Make forecasts for at least one month, preferably in winter, when storms are more regular.

## FIELD WORK.

## Things to be seen in Kansas:

- Running water: Erosion, deposition.  
 Weathering of rock and production of soil.  
 Work of underground water: Water level, sink-holes, springs, flowing wells, wells.  
 Glacial drift, northeastern part north of Kansas river.  
 Mountain west.

## APPARATUS NECESSARY.

## Map work:

Topographic maps: United States Geological Survey.  
Mississippi river maps: Mississippi River Commission.  
Coast charts: United States Coast and Geodetic Survey.  
Geological folios: United States Geological Survey.

## Meteorology:

Daily weather maps.  
Thermometer.  
Barometer.

Blank maps United States Weather Bureau, \$1.40 per 1000.

## Mineralogical:

Small cabinets containing 30 specimens, labeled and described,  
may be obtained from dealers for about \$2.

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NOTE.—For valuable suggestions on the teaching of physiography, with reference especially to field and laboratory work, consult *The Interstate Schoolman* for May, June, and July, 1907, Hutchinson, Kan.

BOTANY. *One unit.*

THE FUNCTION OF BOTANICAL INSTRUCTION. In common with other studies, botany affords training in observation and reasoning, and in planning the course this must be kept sight of in method and matter; and it is the function of an elementary course of botany also to give an exact knowledge of the most important facts about the nature of plants. The very fact that we are absolutely dependent on plants for our existence, and that they strongly influence our lives in many ways, establishes for botany a natural place in the list of the most important studies offered in the secondary schools. It should be the aim of botanical instruction in these schools not to make botanists, but to disseminate knowledge of how plants are constructed, how they get their living, how they react to their environment in a way helpful to them, what their place in nature is, and how they help us and how we may help them. The story of plants has an esthetic and a practical side. Almost any fundamental fact about plants bears on both sides; it enhances our appreciation of plants, and helps us to deal with them more intelligently. This, in a word, it is the part of botanical instruction in the secondary schools to accomplish.

THE METHOD. Primarily the plants themselves are to be studied, and only secondarily what somebody says about them. The study is to be exact, detailed, and thoughtful; not hurried, cursory, and without satisfying application and conclusion. The problem of supplying materials for a year's course is simple enough if the work is thoroughly done; but if the pupils are al-

lowed to skip hurriedly from subject to subject, the materials for a year's course will have been gone over in a month, the pupils will have acquired no good in training or knowledge, and the teacher will complain that it is impossible to offer a year's course in the secondary schools. To insure the right sort of work the pupils are to make neat and exact drawings and intelligent notes for each subject worked out in the laboratory. The drawings are to be made with a hard drawing-pencil (6-H Koh-I-Noor is the most satisfactory), on heavy, unruled linen ledger paper. The notes, written in ink, are to face the drawings, so that drawings and notes can be compared without turning the page. The notes should be on separate sheets, and not on the backs of the drawings. Both drawings and notes are to be placed symmetrically on the pages. Before beginning a page of drawings, it is to be determined how many are to go on that page and where they are to be placed, so that when the pages are completed they will be pleasing in their symmetry. The drawings are to be simple outlines, done with care, so that they are distinct, neat, and in right proportion. When the pages are done—drawings and notes—they are to show intelligently and truthfully what the pupil should learn from his subject, and they should be pleasing to look at. Inexact and slovenly work is an abomination, and worse than nothing. To let such work pass is to do the pupil an injury.

Why require drawings when so much time is consumed in their making? Because they are the most exact and the simplest mode of expression in the study of form and structure. Pupils who think they cannot draw can yet express themselves about form and structure better in that way than in spoken or written language. Again, when drawings are to be made, the pupil becomes a more exact observer. The notes are to tell what the parts of the drawings are, how the materials are prepared for study, and what facts of plant life, structural, physiological, or ecological, have been learned. They should show that the pupil has been thinking about his work and sees its meaning. To insure that all this be well done the laboratory book must be gone over by the teacher at frequent intervals, and its defects discussed with the pupil, and the necessary improvement insisted on before a passing grade is obtained. In being thus guided with a firm hand the pupils are apt to like their work better and are sure to respect it.

Whenever possible, physiological experiments should accompany the laboratory work on form and structure. These may be prepared by the teacher, or they may be assigned to groups of pupils for demonstration before the entire class. Directions for such ex-

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periments will be found in some of the books cited below. Form and structure dissociated from physiological function or adaptation to the outer world are the mere husks of botany, and as soon as learned they are to be followed by an inquiry into their reason for being. Studied in this way, botany is a subject of intense interest to any one who wants to know what and how God hath wrought. Happily physiological experimentation is within the possibilities of any school, for the necessary apparatus is simple and can be arranged by teacher or pupils.

Field excursions are a good thing. The teacher should take out not more than eight or ten pupils at a time. He should go over the ground beforehand and become familiar with the problems that can be worked out in the locality to be visited. In the laboratory, form, structure and function are learned to best advantage, and in the field, adaptation to the outer world, and distribution. Therefore field-work becomes necessary to a properly rounded course. But it should be genuine and definite work, and not merely a pleasure excursion. To insure successful field-work the teacher must be familiar with the ground to be traversed, must have put definite problems before the pupils, with a plan for their execution, and must have only a small group of pupils to supervise.

The time devoted to botany, including laboratory work, recitations, and discussions, but not preparation for recitations, should be not less than five hours per week. Where the periods are less than one hour, as in most instances, the pupils should be required to complete the time at other hours. This is justifiable, since the preparation for recitations does not require as much time as other studies, two recitations per week being all that would be necessary.

**EQUIPMENT.** The first requisite is a well-prepared and enthusiastic teacher. When a teacher with little or no preparation is made to teach botany as a side issue it is an injustice to the teacher, the pupils, and the subject. It were far better not to offer the subject at all under such conditions. It may be stated as a general rule that to be well prepared the teacher should have worked through the equivalent of the botany courses I to V, inclusive, in the University catalogue for 1906-'07, namely, courses in elementary general morphology, plant histology, cryptogamic botany, experimental plant physiology, and systematic botany. With such preparation, the right sort of a teacher is bound to make a success of his course, no matter how poor the laboratory equipment may be. But a good laboratory equipment is a great help, and so inexpensive that no school need be without it. There should be flat-topped tables, about thirty inches high, affording elbow room for each pupil, placed be-

fore windows, so as to get plenty of light. Each pupil is to have a good magnifier mounted on a block, so as to leave both hands free for the use of dissecting needles. The doublet magnifiers of three-fourths-inch focus manufactured by Bausch & Lomb, Rochester, N. Y., or by the Spencer Lens Company, Buffalo, N. Y., are satisfactory. The blocks may be made as described in Stevens's *Introduction to Botany*, page 371. The Barnes dissecting microscopes, made by Bausch & Lomb, and listed at \$2.50, but subject to discount, will answer every purpose. Each pupil is to have two dissecting needles (easily made by thrusting strong needles into soft wood handles), and a sharp pocket-knife. This completes the apparatus needed by each pupil.

The laboratory should have at least one compound microscope for the demonstration of minute anatomy. More of these, if it can be afforded, would be highly desirable. The Bausch & Lomb BB4 special, and the Spencer No. 50 E, compound-microscope outfits, sold to schools at approximately thirty-five dollars, fill all requirements. There are cheaper outfits supplied by these companies and other dealers. Even the cheapest outfits of the Bausch & Lomb and Spencer companies, catalogued as A1 and 80 A, respectively, costing schools approximately ten dollars, would prove very useful. The laboratory should own a Spencer table microtome for hand-sectioning and a sectioning razor, together costing schools ten dollars. Information about the necessary stains, reagents, etc., will be found in some of the books cited below. If the school can afford it, the laboratory could be more completely equipped as advised in *Ganong's Teaching Botanist*, mentioned in the book-list below.

In carrying out a course logical in sequence, such as that outlined below, some facilities for preparing materials must be provided. First of all there should be a room, or part of a room, kept warm enough for germinating seeds successfully, provided with rough boxes filled with white pine sawdust for seed-beds, and jars holding water in which branches of woody plants can be forced into leaf and blossom when needed. Some schools use successfully the basement furnace-room for this purpose, and any basement room will do that can be kept warm enough. Then there should be a cupboard in which seeds and fruits gathered during the summer to illustrate dissemination can be stored in boxes away from mice, and in which Mason jars containing two per cent. formalin, or equal parts of alcohol, glycerine, and water, for preserving flowers and parts of plants for sectioning, can be kept handy and safe from breakage. A general might as well attempt a campaign without ammunition as a teacher a course in botany without having planned to supply

the necessary materials for study in abundance, at the right time, and in suitable condition. Directions for providing materials will be found in detail in Ganong's Teaching Botanist and Stevens's Introduction to Botany.

**THE COURSE.** In planning the course two questions chiefly must be considered: What subjects will give the best enlightenment about plants in the brief time of an elementary course? And what materials is it practicable for the secondary schools to provide for laboratory study in abundance throughout the school year? Happily these are not conflicting problems. Their solution is found in the following sequence of subjects:

1. *Seeds and Seedlings.* Study Lima bean, castor-bean, and Indian corn, dry, soaked, and in different stages of germination. A seed is a plant in its simplest terms, and affords a logical beginning. The pupil is to learn what a seed is, what its purpose is, what its different parts are for, and how they perform their functions during the resting period of the seed and during germination.

In the food stored in seeds he learns what sorts of materials constitute the real food of plants. In watching what becomes of this food during germination he learns about digestion and the assimilation of food into new plant substances. By simple experiments with germinating seeds he learns the conditions necessary to growth, and about respiration. In watching the parts of the seedling find their wonted directions of growth, no matter in what position the seeds lie, and with simple experiments to bring out further information, he learns that plants are sensible to outer influences, and respond in a way to accomplish for themselves the most good. By comparing the different types of seeds and their variations of habit in germination he learns how plants of different kinds work out the problems of their existence in ways dissimilar in detail but alike in general result. With this much accomplished the pupil has made a good beginning in method, knowledge, and awakened interest.

2. *Roots.* Study the definite order of outgrowth of lateral roots from the main root of seedlings, and the indefinite order of succeeding rootlets. Study root-hairs on seedlings grown on moist blotting-paper or in any suitable moist chamber. Demonstrate with a compound microscope the cellular structure of roots in cross and longitudinal sections, calling particular attention to the tracheal tubes through which the water rises in the plant. Demonstrate the rise of water by osmosis in an artificial apparatus. Demonstrate the attraction of roots by moisture. The pupil is to learn the function of roots in fixation, absorption, and conduction; the

nature of root-hairs, and how admirably they are adapted to fit into the small interstices of the soil and put themselves in close contact with its finest particles, so as to absorb the films of water about them and the minerals in solution. He is to learn here what the plasmatic membrane is and how it keeps the important substances of the cell sap from becoming lost into the soil while permitting the entrance of water and dissolved substances. He is to study the formation of adventitious roots in cuttings, and their value in the propagation of plants. He is to learn about roots used for storage, the roots of parasites, as in dodder, and the roots of air plants. He is to learn about the nature of the soil, and the great extent and depth which some roots have.

3. *Buds and Stems.* Study young branches, with buds in their winter condition, of horse-chestnut, cottonwood, and lilac. Horse-chestnut is particularly fine; but if it cannot be obtained, hickory may take its place. Study these buds in various stages of unfolding, having forced their growth in jars of water in a warm room. Study leaves in embryo in the bud, and note their behavior as they grow to maturity, and try to find good reasons for everything observed. Study position of leaves on the stem, and their relation to lateral buds, and the age of the stem on which they are found. Demonstrate the cellular anatomy of stems in cross and longitudinal sections. Learn the functions of the different zones of tissues in bark and wood. Learn the nature of a ring of growth and the purpose of its two zones of early and late growth. Examine the cellular structure of the stem of a monocotyledonous plant, such as corn. Study experiments to show the rise of water through the wood and the circulation of elaborated food through the inner bark. Study the use of buds and cuttings in plant propagation. Proceeding in this order, the pupil learns the nature of a shoot (stem and leaves) in its embryonic condition in the bud, and how the favorable conditions of spring are quickly used to advantage by having the parts which are to grow forth already formed in a miniature the previous season. He learns the admirable plan of packing these parts away within the small compass of a bud, and protecting them by means of scales, hairs, resinous substances, etc. He learns that there is a double highway for the conduction of materials in plants, and he should think this over and find the wisdom in it. The "ring of growth" is no longer a mere phrase, but answers a physiological necessity. He learns that the qualities of a plant may reside in every small part of it, so that a single bud can transmit faithfully all that a plant is, and so be one of the most important means of propagation; and he should see how the habits

and mode of life of plants demand this. By a comparison of the cellular anatomy of dicotyledonous and monocotyledonous stems he learns how plants have solved the problem of increase in diameter and provision for strength and the transportation of materials after two distinct plans; to best advantage, however, evidently in the dicotyledonous plan, since a vastly greater variety of such plants have succeeded as trees.

4. *Leaves.* Study leaves of different shapes and sizes, and, wherever possible, see how form, size, angular divergence and vertical distances apart are correlated with the size and habit of the plant and the place in which it grows. Study the positions which leaves take with reference to the incident light, including such a variety of positions as shown by the elm, maple, cottonwood, Solomon's seal, grasses, and compass plants. Determine whether these different positions are equally advantageous, and whether there is not an ideal position that would serve best in all cases. Determine by experiment what light has to do with the directions which leaves assume. Study the cellular anatomy of a leaf; the epidermis with its stomata and its imperviousness to water; the palisade and spongy parenchyma with their chloroplasts, the intercellular spaces, and the vascular bundles of veins. Compare the starch content of leaves that have been kept in the dark with that of those which have been kept in the light. Study the starch content of leaves that have been kept in the light in an atmosphere devoid of carbon dioxid, and of leaves kept in the light with stomata artificially closed. Confine leaves under glass jars, and study the effect on the oxygen and carbon-dioxid content of the jars when kept in the light, and again in the dark. Demonstrate the transpiration of water by the leaves. Compare leaves of ordinary land plants, desert plants, and water plants, and determine the reasons for their chief differences. The pupil learns that the leaf is the part of the plant which has the manufacture of the plant's food as its chief function. He learns how carbon dioxid is used in this process, and the fact that the sunlight supplies the necessary energy; he learns that leaves breathe (it is not implied that the other parts of plants do not breathe, for they do), and that the water absorbed by the roots is given off by them. He understands, when he compares the cellular anatomy with the particular function of each part, the wonderful structural adaptation to the energy and materials to be used and the work to be done. He learns that leaves are able to perceive the direction of the source of light and to respond to it in a useful way. In studying the different kinds of leaves he perceives the fact of great

variability, one of the most important facts in nature. In comparing the leaves of ordinary land plants, desert plants, and water plants, he learns of the power of plants to modify the forms and character of their members in a way that is directly adaptive to their environment, another of the most important facts in nature.

5. *Growth and Movement.* With a compound microscope demonstrate the embryonic condition of the cells at the apex of an onion root, and show how these become changed into permanent tissues of the bark and wood farther back in the older portions of the root. Learn the processes of nuclear and cell division and the evident significance of the great care taken. Demonstrate regions of continued growth in dicotyledonous plants and grasses. Demonstrate the effect of different intensities of light on growth. Determine the relation of the cambium ring to the additions to wood and bark. Study under different conditions the behavior of the leaves of sensitive-plant seedlings grown under bell jars ventilated at the bottom. Study the behavior of twining plants and sensitive tendrils. Read about other cases of sensitiveness in plants. It will be noted that most of this work consists of demonstrations before the entire class. While the subject of growth and movement as here outlined does not consume much time, it is yet one of the most important in plant study. The pupil is introduced to the wonderful facts of cell multiplication, and differentiation from a common origin into various forms to meet different functions. He will find it interesting and instructive to speculate why plants continue to increase in size just where they do and not otherwheres. He has learned more about the sensitiveness of plants to the outer world and their ability to respond to their perceptions in a useful way. He is now prepared to see that plants are endowed with something little short of intelligence.

6. *Modified Parts.* Study roots, stems, and leaves that have been modified so as to perform other than their usual functions; thus, the thorns of wild crab, hedge, and honey-locust; sweet and Irish potatoes; the onion; the tendrils of wild smilax and garden pea; all of the vegetative parts of greenhouse smilax and garden asparagus. Here the pupil learns more about the plasticity of plants in molding the forms of their members to meet specific requirements, and the capacity of plants to vary for known or unknown reasons, and he is in a position to understand better how the great diversity of plant forms has come about. In applying the lines of evidence which he must follow in determining whether unusual forms are roots, stems, leaves, or something else, he is getting good training in careful observation and logical conclusion.

The work thus far outlined, done with the care suggested under "Method," begun at the opening of school in the fall, will not be completed long before the flowers of early spring appear. We are now ready to take up the study of flowers, and the gap can be supplied with flowers that hold their form well in formalin, such as the yucca, asclepias, trumpet-creeper, and Compositæ of the sunflower sorts. It will be noted that the material needed for the course up to this point is such as can be provided right along through the winter with the most ordinary facilities.

7. *Flowers.* Study first flowers of simple construction, such as the yucca, dog's-tooth violet, anemone, and shepherd's purse. Then select flowers of more complex construction, which have been adapted to protect pollen and nectar and to assist in cross-pollination, such as asclepias, larkspur, iris, and violet. Then study several species of a genus, several genera of a family, and typical species of closely allied families, to bring out the evidences of relationship and the grounds for classification. The object is not to work over as many flowers as possible, but to select a few with a definite purpose in each case. The teacher should see that the leading questions properly pertaining to each flower selected have been asked and answered. The teacher will find many useful suggestions in Müller's *Fertilization of Flowers* and Kerner and Oliver's *Natural History of Plants*. With diagrams make clear the process of fertilization and the results. Discuss the benefits of cross-fertilization, and in this light interpret the frequent elaborate devices to secure it. Besides the drawings of dissections, have the pupils make cross and longitudinal diagrams of the flowers to bring out the main structural facts clearly. Go over the evidence about the evolution of a flower from its simpler representatives in the lower plants. The pupil learns what a flower is and how its different parts are adapted to their functions. He learns the wonderful relation of insects to flowers, and how many flowers have adapted themselves to this relationship by modifications of form, etc. And so the evidence is accumulating for him that plants are not cast in rigid molds, but are responsive and adaptive to various influences of the outer world. He learns that there is a real blood relationship between plants differing in general appearance, and that, although there is no written book of lineage for them, the evidence of relationship is by no means obscure and furnishes the ground for classification. He learns the essential facts about sex, the same in plants as in animals, and the use of sex differences in bringing about a more vigorous offspring, and as a means of variation. With this knowledge he has a foundation for an understanding of scientific plant-breed-

ing, which is now being perfected in the experimental stations and is proving of untold advantage to agriculture. Thus his appreciation of flowers is definite and increased many fold.

8. *Distribution of Fruits and Seeds.* Study special devices for scattering seeds, by means of the elastic action of carpels and ways of that kind, or by outgrowths from the seeds themselves in the form of hooks, hairs, or wings. Study fruits that have devices to aid distribution, such as fleshy and nut-like fruits, and fruits with hooks, parachutes, and wings, etc. Determine in each case what part of the seed or fruit furnishes the device. For this work material must have been put up in formalin or dry in boxes the previous summer or fall. The pupil learns the efforts which plants have themselves made to secure dissemination. He learns that they have been able to attain the same end in a great variety of ways; that they have modified various of their own parts, and pressed into service different kinds of outside agents. The evidence of the completeness of the adjustment of plants to their environment has been accumulating before the pupil throughout the entire course.

9. *Algæ, Fungi, Mosses, Ferns.* The work in these subjects cannot be so thorough as in the previous ones, because the time will not permit, and the equipment in compound microscopes will in all probability not be sufficient. But the pupil must not leave the subject of botany without some exact knowledge of these lower plants. Study with the naked eye, simple magnifiers, and as much as possible with a compound microscope, algæ growing in ponds, watering-troughs, etc., and on the north sides of trees; bread mold, wheat rust, and toadstools; mosses bearing capsules; ferns with sporangia, and their prothallia. Even with this cursory study a great deal will be cleared up that before was obscure to the pupil. In the study of the algæ the pupil learns by what simple forms an independent existence can be carried on, and he sees in them the possibly very early progenitors of the highest forms of the present day. He learns about the simplest mode of multiplication by the division of a parent cell, and possibly his material will show the formation of spores. In the fungi he learns about the peculiar habit of parasitism or saprophytism. He sees in them the apparently degenerate descendants of the algæ that have lost their chlorophyll, and consequently their independence, or it may be that they gave up their independence and lost their chlorophyll as a penalty. He learns that these forms of life cause the destruction of organic substances and disease in living organisms. In the study of fungi the bacteria and their activities may have also been considered. In the study of mosses he sees the first efforts at the

differentiation of the plant body into roots and leaf-bearing stems, but with true roots not yet evolved. He sees the very simplest forms of leaves, which are, nevertheless, efficient food-makers. In the ferns the pupil finds a more successful attempt to differentiate the plant body into roots, stems, and leaves. He sees a clear case of the wonderful habit of alternation of generations, which is present but obscure in the mosses, and present and still more obscure in the higher plants. The teacher will use his own judgment about attempting to relate the story of alternation of generations and its apparent significance in the study of evolution. It is one of the wonderful things about plant life, and of great use as evidence of relationship between the lower and higher forms. But it is an unusually difficult subject, and unless thoroughly exploited is apt to lead only to confusion. Still, it would seem too bad to pass so close to a wonderful fact and leave it untouched.

This will end the year's course. It will be seen that it is full of hard work and requires a wide-awake mind. But we expect this of any study that is worth while. Having gone through it thoroughly the pupil's horizon will have been immensely broadened and his interest in the world about him enhanced.

There seems to be the absurdity abroad, even among some school-teachers, that the study of botany in the high schools should be made easy—a sort of gentle wafting of the pupils on beds of roses into a more or less sentimental appreciation of form, color, and fragrance, and the like. This seems to be a product of the fairy-tale sort of nature study which gives a cheap representation of what, as it stands uncolored, is already marvelous beyond conception.

It is this fictitious sort of botany, without any care for the exact truth, and without purpose or logical sequence in its methods, and unexacting of those who study it, that has brought the real science into disrepute amongst serious people, and kept it from taking its rightful place by the side of language and mathematics as affording the right sort of training and a worthy body of knowledge.

10. *Helpful Books.* There is one book that stands preeminent in its helpfulness to teachers: *The Teaching Botanist*, by William F. Ganong, published by The Macmillan Company, New York. In it a sufficiently complete list of botanical books will be found. Some other books should be mentioned here. Müller's *Fertilization of Flowers*, The Macmillan Company, is an indispensable help in the study of flowers. Kerner and Oliver's *Natural History of Plants*, Henry Holt & Co., New York, is replete with information about all phases of plant study; this should be in every school library. Geddes's *Chapters in Modern Botany*, Charles Scribner's Sons,

New York, is a series of very interesting essays in the modern scientific spirit. Barnes's *Plant Life*, Henry Holt & Co., is a clear and logical presentation of the subject from the standpoint of the relation of form to function. A *Text-book of Botany*, by Strasburger Noll, Schenck, and Schimper, is written by specialists in its different parts, and is one of the most satisfactory texts yet published. This is issued by The Macmillan Company. Ganong's *Plant Physiology*, Henry Holt & Co., contains explicit directions for carrying out the experiments demanded in the above course. Stevens's *Introduction to Botany*, D. C. Heath & Co., Boston, contains detailed directions for carrying on such a course as is outlined above. Peirce's *Plant Physiology*, Henry Holt & Co., contains a clear and up-to-date summary of our knowledge of physiological processes. Chamberlain's *Methods in Plant Histology*, issued by the University of Chicago Press, is an excellent guide to histological technique. Professor Coulter's books, *Plant Relations* and *Plant Structures*, beautifully written and illustrated, issued by D. Appleton & Co., New York, should be in every school library.

#### PHYSIOLOGY. *One unit.*

The study of living forms and of life phenomena make an important and essential part of nature study. The physiology of man is the most interesting and important field of physiology, and an outline of education which omits this subject cannot be accorded a place among the modern systems. To encourage the more systematic teaching of this important subject, the University will accept it as an entrance unit, provided that the study occupies a full year of high-school time and is taught by laboratory methods and by specially prepared instructors.

Rules of hygiene form legitimate corollaries to principles of physiology, and should be presented in their logical relations.

When one is discussing, for example, mastication and the use of the teeth, the necessity for thorough mastication and salivation can hardly be omitted from the discussion. There seems to be no tenable argument against allowing the discussion of rules of hygiene in connection with each function studied.

This study should nourish the moral nature by creating a habit of sympathy with nature; by arousing a love for beauty and symmetry of form and by revealing the design and adaptation of structure in animal life; by instilling a tenderness for lower forms and by leading to a recognition of responsibility to law as manifested in the cooperation of the functions of the organs in the body.

**METHODS.** Physiology cannot be taught from books alone. It is of primary importance that it be made clear and full of meaning by illustrations, charts made by the teacher in addition to the diagrams placed on the board, models, preparations, both preserved in formule and fresh material from the slaughter-house, and also with the aid of simple experiments to illustrate the anatomy, structure of tissue and functions of animals.

The general method of presenting the subject is the same as that followed in all biological sciences, viz., the laboratory method, according to which the student is led to discover for himself certain facts and to formulate from his collected data conclusions which represent fundamental principles of the science.

To insure the best results, and to cultivate the power of observation and expression, the pupils are to make neat and correct drawings, properly labeled, and intelligent notes for each subject studied—the latter placed on a page opposite to and facing the drawings. The notes should state the object of the experiment, the method and material employed, the observations, and, when possible, a conclusion drawn from the observations.

To insure good results, the laboratory book must be criticised and its defects discussed with the pupil, and the necessary improvement insisted on before a passing grade is obtained.

The time devoted to the subject should be about two laboratory periods of eighty minutes each and three recitations per week.

The method need not be an expensive one, and from the standpoint of pedagogy it is more economical than the text-book method, because it leads directly and surely to definite results. No special room or table are needed. At a little cost deep tin pans about ten inches in diameter with a half-inch layer of part beeswax and part paraffin in the bottom answers very well for all dissecting purposes. A skeleton, compound microscope and manikin are essential. Bones with muscles can be obtained from the meat-market, offering opportunity for the study of muscle, cartilage, connective tissue, tendons, arteries, veins, nerves, fat, marrow, ligaments, and the joints.

Most of the organs can be studied from frogs, birds or mammals prepared in formule; and drawings made of the important systems will give the pupils some conception of the relation and structure of these in the human body. Respiratory, cardiac and muscle activity can be studied on one's self as well as on frogs and cats. The circulation in the frog's web, the study of the epithelial cells scraped from the lining of the mouth, frog and human corpuscles, and mechanical and electrical stimulation of nerves and muscle offer

rich fields for interesting study. Success here as elsewhere depends upon the qualifications of the teacher.

LIST OF REFERENCES.

Huxley's Human Physiology, published by The Macmillan Company.

Experimental and Descriptive Physiology, Colton, published by Heath & Co., Boston.

Outlines of Practical Physiology, Stirling, published by Griffin & Co., London.

Personal Hygiene, Pyle, published by Saunders & Co.

Martin's Human Body, Brief Course, revised by Fitz, published by Henry Holt & Co.

Physiology for the Laboratory, B. M. Brown, published by Ginn & Co.

Laboratory Outlines of Physiology, I. H. Hyde, Lawrence, Kan.

ZOÖLOGY. *One unit.*

To meet the many and increasingly frequent requests for information concerning the teaching of zoölogy in the high schools, this circular is issued. The growing importance of the biological sciences in both the high-school and college curricula makes necessary, so far as possible, the establishment of some standard which shall serve to coordinate the work of the different schools of the state. In addition to thus outlining a course of study, there will be included suggestions regarding laboratories, apparatus, and materials, which, it is hoped, may be of service. This is done because numerous letters received from the teachers of zoölogy throughout the state indicate the desire for assistance of this sort. It is the wish of the department of zoölogy at the University to be of service to the other public schools of the state in carrying on the work with which it is concerned, and it is hoped that the teachers of the secondary schools will come into as close touch as possible with the department and its instructors.

PURPOSE OF THE COURSE. There is hardly any necessity for saying that, in making the suggestions regarding the high school course of zoölogy that follow, the main thought kept in mind has been, not what would be best for the student who wishes to continue the subject at the University, but what will give him the best sort of training in that province of learning which it is the peculiar privilege of the observational sciences to occupy. And in this connection it may here be observed that the best teachers of these sciences do not regard the elementary courses as primarily

designed for affording information, but rather as a means for training the mind to observe facts and to arrange and present these in a clear and logical manner.

CHARACTER AND EQUIPMENT OF THE LABORATORY. Obviously there can be no training of this sort by means of mere text-book work, and so it may be said in the beginning that the prime necessity of a course is a direct study of the animals themselves. This necessitates a laboratory and suitable equipment. Regarding the room, it may be said that it is almost necessary to have it arranged so that it may be used for the one purpose alone, and to have it provided with tables rather than with desks. These need not be expensive, since the common kitchen table serves very well. Numerous windows are an advantage, and they are best situated on the north side. So far as general laboratory equipment is concerned it may be very simple. There will need to be receptacles for holding the specimens, and for this purpose stone jars of four or five gallons capacity serve excellently. Then some aquaria for live material are needed. These may be purchased at reasonable prices, but in their absence candy jars, fruit jars, battery jars, or any glass vessel of sufficient size will do. Ordinarily the greatest difficulty is encountered in the equipment of the individual student. The following account of such apparatus as the student finds necessary for his work was published in the *Journal of Applied Microscopy*, and indicates what it has been found possible to get along with at the University:

APPARATUS FOR THE INDIVIDUAL STUDENT. The question of a suitable equipment for large laboratory classes in elementary zoölogy is often a most serious and perplexing one. Not only is it difficult to find the pieces of apparatus already made, but even when purchasable the attendant expense makes them unavailable in many cases where large numbers are required. In nearly every laboratory these difficulties have been met and solved more or less satisfactorily, usually by designing such apparatus as can be made in local shops.

Such a set for the individual student, evolved in actual practical work, is described here. Aside from dissecting pans and instruments, it consists of two pieces—one an easel, the other a standard for the support of lenses, etc. The easel is merely a piece of soft pine or poplar board  $5 \times 6 \times \frac{1}{4}$  inches, supported behind by a piece of bent wire attached by small staples. Crude and simple as this is, it insures better work for the student at a much less degree of personal discomfort than is otherwise possible. Since the style of drawing usually required of beginners is that known as ortho-

graphic projection, it becomes necessary to view the specimen from directly above each part drawn. If no support is provided, the student either lays the specimen upon the table and endeavors to look down upon it, or he props it against books or other objects, so that it may be observed more easily. In either case the process is time-consuming and troublesome.

The specimen, a crawfish for example, is pinned to the board against a suitable shade of paper for a background, the appendages are arranged and secured to the board, which is then erected at such an angle that the line of sight falls upon it normal to the surface. In this position the animal is well lighted, is easily measured, and the tendency to introduce perspective in the drawing is minimized. When a lateral view is desired, the specimen is pinned to the top of the board near one side, the abdomen is flexed in a natural manner and fastened to the side, the appendages are brought down and secured, and the easel adjusted at the upper angle. It is not difficult to draw the animal when thus mounted, for a proper view is easily obtainable, and the edges of the board serve as guide-lines from which to measure.

The lens support is made by taking a piece of brass rod three-sixteenths of an inch in diameter by ten inches in length, rounding one end with a file, and splitting the other in the center for an inch with a saw. Two holes are drilled through this end at right angles to the split, and then, after heating, the halves are bent out until the flat surfaces lie in one plane. By means of rivets passing through the small holes the rod is secured in the middle of a tin ointment box lid about three inches in diameter, which, in turn, is filled with melted lead. The standard thus produced is very firm and stable and occupies little room.

The lens-holder attaching the magnifier to the standard is made by taking suitable brass or galvanized-iron wire and forming on one end a loop of a proper size to hold the lens, and on the other a close spiral of about four or five turns whose inner diameter is very slightly greater than that of the brass rod in the standard. Two of these are conveniently formed at one time by winding a spiral of eight or ten turns in the middle of a piece of wire twice the length of the desired support. This is then cut through the center and rings formed at the free ends for holding the lenses. It is advantageous to bend the support downwards, so that the lens may be lowered over the edge of the dissecting pan. A lens thus supported may be swung around over a large specimen, and is conveniently focused by sliding the spiral up and down the brass rod.

This apparatus, by the addition of another lens-support, serves

an excellent purpose in the examination of small parts and dissections, and makes the use of the microscope much easier for the beginner. In making use of the apparatus for this purpose, it is arranged as follows: Upon the ring of the lower support is placed a piece of non-drying modeling-clay (to be purchased of dealers in art and laboratory supplies). If the parts are to be examined dry, they are pressed down into the clay and arranged as desired; if they are to be immersed in water, a depression of suitable dimensions is made, and in the bottom the parts are secured. Water is now poured into the improvised pan and the specimen is ready for observation. Should specimens transfixed by pins be used, they are easily fixed and oriented in the clay. The holder is elevated to a convenient height above the table, the lens is focused, and the observer may then examine the specimen with one eye and, without moving the head, make the drawing.

The modeling-clay previously mentioned is useful in many ways. When irregular objects are to be held in position, either upon the table, easel, or wire support, they may quickly and easily be secured by a piece of the clay. Small fragile structures, such as the mouth-parts of insects, are readily mounted in any position by pressing them into the surface of the clay. Numerous other uses suggest themselves in practical work, which need not be mentioned.

Aside from the two pieces of apparatus described, nothing more is required for class use except dissecting pans and instruments. The former should be of different sizes, and may be made by pouring melted paraffin into suitable tin pans. It is usually desirable to have projections of some sort in the bottom to anchor the paraffin. For many purposes a black background is desirable, and this is obtained by mixing lampblack with the melted paraffin. Small pans may be made by using the bodies of the ointment boxes, the tops of which were utilized as the bases of the lens standards. Small pasteboard boxes thoroughly soaked in melted paraffin are light and convenient and last well.

Improvised dissecting instruments, except needles, are not to be recommended. Excellent ones, perfectly adapted to their purposes, may be purchased at reasonable prices, and are always to be preferred.

OUTLINE OF THE COURSE. Every teacher has his own ways of working, and can secure the best results by following out the methods that seem to him best adapted to the time and place. Nevertheless, there are certain general principles that should govern the presentation of any subject, and in order to indicate the nature of these to such teachers as may be in doubt concerning the extent

and character of the work involved in an elementary course in zoölogy, some suggestions may be given. In the first place, it must always be held clearly in mind that zoölogy is the study of animals and not of text-books. Evidently enough, then, the course must be so arranged as to give the student the largest personal acquaintance with animal forms, and since it is obviously impossible to bring before him anything but a small representation of the animal kingdom, such a selection must be made as will give a place to all the important groups. In this matter of selecting the so-called "type specimens" there is a good deal of latitude, which may be improved by utilizing common indigenous forms, but the temptation to take what is at hand must not be allowed to exclude from consideration representatives of important groups that are not so immediately available.

In making this selection of types, then, the first consideration is representativeness. The form chosen for study must be one that exhibits clearly the peculiarities of structure which mark the group of which it is a member. In general only the salient morphological points can be brought out, but in one or two forms that are particularly favorable a more detailed study can be undertaken with profit. By this means the relative values of structural characters as a means for determining the relationships of animals can be demonstrated practically. The number of groups that can be studied will depend to some extent upon the availability of the material and upon the equipment with which it is to be so studied. In general, representatives of the following branches will be found adapted to the ordinary high school: Arthropoda, Mollusca, Echinodermata, Annulata, Coelenterata, and Vertebrata. Because of their numerical importance and practical bearing upon human affairs the arthropods may demand a more extended consideration than the other types.

To meet the requirements of the course there may be selected the following animals for the laboratory work: Crawfish; grasshopper; clam; starfish; earthworm; jelly-fish; frog. Of this list, all except the starfish and jelly-fish may be found in practically any part of Kansas, so that, as a matter of convenience, they leave nothing to be desired. These forms represent their branches perhaps as well as individual species may, and are of convenient size to work with.

The order in which these forms are taken up is of no little importance, but it is scarcely possible to make a rule that is of general applicability. A strictly logical method of procedure would, of course, be to commence with the lowest forms and study the higher

in the order of their complexity, or conversely, to note the highest development of morphological characters, and then to trace them back in the simpler animals. To most workers there have appeared practical objections to both plans. In the first instance the forms are small and require the use of a compound microscope, which places the beginning student at the double disadvantage of working with strange objects under quite unfamiliar conditions of observation. There is the further difficulty that an instalment of compound microscopes is necessary, and this is often beyond the resources of the high school. The main objection to the second plan is that it introduces the student to a highly complex development of the various systems, which not only renders necessary very skilful dissecting work, but occupies a disproportionate amount of time for attaining what is desired of the beginner. A compromise plan which is thought by many to obviate to a considerable extent the difficulties attaching to the others is to start the student out on a form of convenient size in which the various systems are well enough developed to show in a simple way the main features characterizing them. In this manner the principal structural features and relations of organism may be brought out in a somewhat diagrammatic way, and then by working down to the simpler forms the earlier stages of development may be seen and understood. Finally, with all this preparation, the vertebrate type may be studied and its complex structures appreciated. It is with this idea in mind that the arrangement of types previously suggested has been made.

The mere study of these few specimens, however, is not sufficient—such a course would be almost as bad as the use of a textbook alone. Two things are sought from the personal study of the type specimens by the student. In the first place, it trains his powers of observation and comparison, and gives the instructor an opportunity to determine where the weak points in his preparation and work are. The other end sought is to give the student a concrete detailed image of one animal out of a representative group. With a definite conception thus established regarding the type specimen, it is possible to take up other members of the group and bring out the structural features of the various subgroups. As an example of how this part of the work may be carried on, the case of the grasshopper, the crawfish and the other arthropods may be instanced. If the crawfish has first been studied as the representative of the lowest arthropod class, then the grasshopper, representing the highest class, after having carefully been worked out as an independent organism, may be compared system by sys-

tem with the crawfish. This will develop the main resemblances and differences in the arthropods, so that the student will know what characters differentiate this branch from others. Specimens of the Arachnida and Myriapoda may then be examined and the further class distinctions noted. It is not necessary for the student to dissect and draw all the forms; it is, in fact, much better for the instructor to take a few students aside and confront them with the specimens, asking them to tell wherein they resemble the forms already studied. If they have previously listened to a lecture upon the whole arthropod branch, or have read up in a good text upon the subject, they may be asked to classify the specimens into classes. When the main characters of the branch have thus been worked out by the student, attention may be turned to minor structural characters which serve to differentiate the subgroups.

To indicate how this part of the work may be presented, a series of comparisons based upon the grasshopper may be suggested. The grasshopper, from the order Orthoptera, may be compared with specimens of other insect orders, under the immediate supervision of the teacher, if possible, and these group characters brought out. When the students have acquired the ability to distinguish the insect orders, family characters in the Orthoptera may be illustrated by specimens of crickets, cockroaches, walking-sticks etc. If it is thought desirable to go further, generic and specific characters may be pointed out in the type form studied. The general principle always to be followed is to proceed from the known ground established by a study of the type into the unfamiliar territory occupied by the nearly related forms. When one branch is thus disposed of, another is taken up in a similar manner, and after having been worked over is compared with the previously studied group, so as to establish broad relationships connecting the two. In this way the student is gradually led to a general conception of the animal kingdom, based upon his own individual experiences.

Along with this first-hand observation and correlation work, which should be embodied in a well-kept note-book, there should go careful readings and recitations upon the general laws and phenomena appearing in animals. The life-histories of a few forms should be studied personally and read about by the students, and some simple physiological experiments carried out. It is a good exercise to have certain topics assigned for investigation and require written reports upon them. Insects offer good opportunities for this kind of work, and such questions as the following may cause the student to make profitable direct observations upon the

living animals: "What structures and markings upon grasshoppers shield them from attacks of enemies?" "Describe the methods of flight in four species of grasshoppers." "Observe the actions of two grasshoppers when they meet—do they appear to have any means of communication?" "Do different species of grasshoppers appear to inhabit particular localities?" "What parasites can you find in or upon the grasshopper?"

**COLLECTION AND CARE OF MATERIAL.** In most cases it is a comparatively easy matter to secure supplies of grasshoppers, crawfish, clams, earthworms, etc., and wherever it is possible to have the fresh material it will usually be best to use it. When it is not convenient to keep or to secure specimens of this character, preserved material of the proper sort will serve most purposes. A rule that should almost invariably be observed is to secure material when it is plentiful, and not wait until it is needed. The cheapest and most convenient preservative is a solution of formaldehyde gas. This occurs in the market as a forty-per-cent. solution, called *formalin*, which is to be diluted to two per cent. or four per cent. A two-per-cent. solution is made by taking one part of formalin and nineteen parts of water; a four-per-cent. solution, by using one part of formalin and nine parts of water. Generally the specimens should go into the four-per-cent. solution for three or four days, and then be kept in the weaker mixture. Earthworms must be killed and preserved in alcohol. If running water is available, sufficient live crawfish, clams, etc., may be kept in aquaria, or even in its absence, by keeping aquatic plants with the animals they will thus secure enough oxygen. Earthworms may be kept in a tub of dirt, if it is moistened occasionally. Cages of screen wire may easily be improvised for keeping grasshoppers alive.

Experience has taught that one of the great difficulties in the way of the proper teaching of Zoölogy in the high school is the difficulty teachers have in securing material. In this, as in other matters, the University is desirous of assisting the other schools, and will endeavor to supply material at cost.

**WHERE TO PURCHASE SUPPLIES.** Microscopes and laboratory apparatus: Bausch and Lomb Optical Company, Rochester, N. Y.; Spencer Lens Company, Buffalo, N. Y. Marine specimens: Supply Department, Woods Hole Biological Laboratory, Woods Hole, Mass.; Henry M. Stevens, Carlisle, Iowa. Land and fresh-water forms: Wm. H. Bailey, Lawrence, Kan. Glassware, etc.: Whitall, Tatum & Co., Philadelphia, Pa.

EUROPEAN HISTORY. *Three units.*

The entrance regulations of the University provide that two units of European history must be completed before the end of the Sophomore year. A unit is interpreted to mean one year of five hours a week in high school, or one term of five hours a week in the University. Credit is given only for work in English history; ancient history—*i. e.*, history of Greece and Rome; or medieval and modern European history—*i. e.*, the history of Europe since 475. One term's credit will be given to students presenting a year's work in the high school in any of these subjects. The department of European history offers three courses mentioned above in the Freshman and Sophomore years in the University, so that students who have not taken any or all of them during their high-school course have ample opportunity to do the work after entering the University. Students who receive credit at entrance for work done in the high school, however, cannot, of course, take the same work in the University for credit. Each of these courses, whether done in high school or University, must be complete in itself, and no entrance credit can be given for such courses done as part of the work in general history. It is expected, of course, that the high-school work in history will include as much outside reading, map-making and note-taking as possible.

**CURRICULUM.** The American Historical Association has recommended that four years be given to the study of history in high schools, whenever it is practicable to do so. When this can be done, the first year should be devoted to Greek and Roman history, with a preliminary study of the oriental nations; the second year, to medieval and modern European history; the third, to English history; and the fourth, to American history. Those schools which find it desirable to give only three years to history are recommended to place Greek and Roman history in the second year, English history in the third year, and American history in the fourth. When two years only can be given to history, either Greek and Roman or English history may be chosen, in which case the third year is recommended. If a separate course in medieval and modern European history is not given, English history should be treated with constant reference to European history. The department of European history in the University of Kansas hopes that those high schools which have a four-year course of study will, as far as possible, arrange their work in history according to the above plan, which has been elaborately discussed in the report of the Committee of Seven.

TEXT-BOOKS. Within recent years a serious effort has been made to prepare good text-books in history for secondary schools. The text which will be found most satisfactory depends largely upon the school in which it is to be used and the teacher who is to use it. It should not be forgotten that a text which is satisfactory for the first-year class in high school may be unsatisfactory for the third-year class. Each teacher must learn by experience the text which, under given circumstances, is best. In selecting a text for Greek and Roman history, the teacher will do well to examine those of Morey, West, Wulfson, and Myers. For medieval and modern history there are also four very good texts, Robinson, Munro and Whitcomb, West, and Myers. Robinson and Myers begin with the Germanic invasion of the fifth century; Munro and Whitcomb and West begin with the empire of Charlemagne and devote much more space to the nineteenth century than to the earlier periods. There is even a greater number of books to choose from in English history. Coman and Kendall, Larned, Andrews, Wrong, Cheyney, Channing and Higginson or Montgomery may be recommended. All of the books mentioned are furnished with lists of topics and references which enable the student to supplement the text-book work with outside reading of a general or special nature.

SCHOOL LIBRARIES. While it is believed that a text-book should be used for high-school work, it is desirable that every school should have at least a small library of reference books. Atlases are indispensable. For general European history, the best small atlas is Putzger's *Historischer Schul-Atlas*, which has been recently translated into English (Velhagen a Klassig, Leipzig, about seventy-five cents). Labberton's *Historical Atlas* (3800 B. C. to 1900 A. D., Silver, Burdett & Co., \$1.25), and Johnson's *Half-crown Historical Atlas* (Scribner, \$1), are also useful. A new atlas, covering the period from the Roman empire to the nineteenth century, by E. W. Dow, has been announced (Holt & Co.) For English history, Gardiner's *Atlas of English History* (Longmans, Green & Co., \$1.50) leaves nothing to be desired, besides being of much service for general European history after the fifth century. The student should not only consult atlases, he should have practice in map-making. For this purpose outline maps may be secured very cheaply from the McKinley Publishing Company, Philadelphia, Rand, McNally & Co., Chicago, D. C. Heath & Co., Boston, or Ginn & Co., Boston. Reproductions of great paintings or photographic views of historic places are of some value in the study of history. There are several series of such pictures which may be

had at slight expense. The "Perry Pictures" cost but one cent each (Malden, Mass.); the "Cosmos Pictures" about a half-cent each (296 Broadway, N. Y.); the "Soule Photographic Reproductions," Essenwein's *Bilder Atlas*, Vol. II (Leipzig), and Parmentier's *Album Historique*, Vol. I (Paris), are more expensive.

Collections of "Sources" are numerous. Munro's Source Book of Roman History (D. C. Heath & Co.), Henderson's Select Historical Documents (Bell, London), the University of Pennsylvania Translations and Reprints, etc. (six vols., Philadelphia), and Adams and Stephens's Constitutional Documents, may be mentioned.

It is believed, however, that the high-school student can be interested to better purpose in the investigation of special topics in good secondary works, or in reading good biographies. Good biographies, in fact, are plentiful, and comparatively cheap, and a judiciously selected list of such books will probably be found more useful in a school library than anything else. For Greek and Roman history, Plutarch's "Lives" should by all means be secured. For mediæval and modern history, Hodgkin's Theodoric, West's Alcuin, Lane Poole's Speeches of Mahomet, Stephen's Hildebrand and his Time, Lane Poole's Saladin, Sabatier's St. Francis of Assisi and Mirror of Perfection, Emerton's Erasmus and Villari's Savonarola may be mentioned. There are some very good series of brief biographies for English history that can be secured at slight cost, such as the Twelve English Statesmen Series, Foreign Statesmen Series, etc.

**CLASS RECITATIONS.** The best text-book, the most fully equipped library, can nevertheless do but little toward insuring success in the teaching of history. Whatever success is achieved will depend ultimately upon the use which the teacher makes of the recitation hour. Aside from occasional written examinations, and supplementary oral or written reports, the recitation hour should mainly be devoted to developing the subject by means of questions and answers. Simple as it may seem to ask questions, this method, when properly used, requires ability of a high order and produces results which can be achieved in no other way. It is indispensable that the teacher should have sufficient knowledge of the subject to conduct the recitation without reference to the text-book or to notes of any kind. He should have clearly in mind the main topics that he desires to develop and the order in which he wishes to bring them up. Although it is necessary to ask many questions which require mere memorizing of the text, the teacher should always endeavor to so frame the questions that success in answering will depend upon the student's ability to see relations between

events. The test of successful questioning consists in the ability of the teacher to lead the student to follow a train of thought based upon a given knowledge of facts, which, left to himself, he would never have followed out. It is hardly necessary to say that the teacher must himself be able to perceive more than lies on the surface, and he should carefully avoid what are known in the courts as "leading questions."

There are no rules for learning the art of successful questioning; success depends upon natural gifts and practical experience. Some very common mistakes, however, may be pointed out. Avoid questions on the one hand that can be answered by "yes" or "no"; on the other hand, generally avoid such as can be answered by memorizing the words of the text. Questions that require thought for an answer should be carefully distinguished from those that require guessing. The teacher must avoid a manner which leaves the impression upon the student that he is being quizzed for the mere purpose of showing up his stupidity or the teacher's cleverness. So far as possible, each question should be determined by the preceding question and the answer which has been given to it. Questions should be frequently asked in such a way that the only hope of a successful answer depends upon having given close attention to the entire recitation. Questions should be short, clear, and precisely worded; the experienced teacher knows by instinct when the student has not understood the question, and when he does not know the answer or seeks to gain time. In a word, such questions should be asked as will (a) require accuracy of knowledge, (b) test the ability to see relations, and (c) demand concentration of attention throughout the recitation.

**SUMMARY.** The department of European history thus desires of students who enter the University of Kansas that they shall at least have a good knowledge of the main facts of some particular period of European history, and, at best, a good knowledge of the main facts of the entire field; in either case, it desires that they shall have had, in addition, some practice in the use of books, and some training in perceiving fundamental historical relations.

#### AMERICAN HISTORY. *One unit.*

High schools in which the historical courses conform to the recommendation of the Committee of Seven of the American Historical Association will devote the last year to American history. For this course the University provides one unit of entrance credit, but in order to receive credit it must not be given earlier than the third year in the high school. If given earlier in the course, little more

can be accomplished than has already been done in the grades. The plan of the American Historical Association contemplates uniting American history and civil government, but it will be found in practice that the work in history will consume the entire year and that instruction in civil government can only be incidental.

In most cases it will be best to base the work in American history upon some approved high-school text. The best high-school texts are Channing's *Students' History*, McLaughlin's *American Nation*, Adams and Trent's *United States*, Montgomery's *Students' History*, and MacDonald's revision of Johnston's *High-school History*. With an adequate reference library and an especially equipped instructor, it may be desirable to carry on the work in American history by the topical method. For this purpose many systematic outlines are available. A very excellent one has recently been published by Supt. Geo. R. Crissman, of the Salina public schools. Even when a text is used, the outline is a useful adjunct, or the outline may be used with several texts in the hands of the class. Courses based upon the outline alone should be approved by the University High-school Visitor. Historical geography is best taught by the aid of outline maps. A systematic series of outline maps, prepared by the department of American history of the University and published by Ginn & Co., illustrates all the territorial changes that have ever taken place in the United States. Where it is impracticable to take time to fill out the whole series, the books may be divided and the maps used separately.

Even with a text-book, a reference library is needed for supplementary reading. Good single volumes for a high-school library are Thwaite's *Colonies*, Eggleston's *Beginners of a Nation*, Parkman's *Struggle for a Continent*, Lecky's *American Revolution*, Burgess's *Middle Period and Reconstruction*, Dodge's *Civil War*, and Stanwood's *History of the Presidency*. The most useful sets are Fiske's *Historical Writings*, Schouler's *History of the United States*, the *American Statesman Series*, Hart's *American History by Contemporaries*, and MacDonald's *Charters, Documents and Statutes Illustrative of American History*. With a text, this number of books will furnish ample supplementary reading, but for the library method it should be regarded as a minimum.

### ECONOMICS.

**THE PURPOSE OF THE STUDY OF ECONOMICS.** With this, as with other subjects of study, two aims are to be considered; first, the development of mental faculties; second, the acquiring of knowledge concerning a field in which the student is to be engaged

after leaving his studies. The first of these aims is generally spoken of as the educational, the second as the practical result of a study. Economics, as the science which classifies and explains the activities of man in producing and using wealth—activities that consume an extremely large portion of every man's life—may fairly claim to possess practical value to a very great extent. Nor is this study lacking in value for mental discipline. Teachers are now agreed that educational value is found, not necessarily in the subject, but rather in the way the subject is taught. Subjects that have been longer taught may have some educational advantage in the fact that their scope and method have been more clearly defined and settled by longer experience of teaching. Still, the disadvantage under which economics labors by reason of its comparative newness in the school is by no means great. Indeed, in the hands of a resourceful teacher this newness may add to the interest and usefulness of the study by making it more adaptable to peculiar conditions.

The second of the aims of study mentioned above—the accumulation of knowledge concerning things with which the student is to have necessary and important relations—can certainly be satisfied by few subjects so well as by the subject of economics. This practical value of economics as a high-school study, as a means of fitting for capable participation both in public affairs and in private business, has been set forth in a previous bulletin of the University (vol. VIII, No. 1), which will be sent on application to the Registrar.

**THE METHOD OF INSTRUCTION.** The comparative newness of this subject and its consequent flexibility give opportunity for a good teacher to make economics extremely instructive by adapting his method to the conditions familiar to his students. It is generally found advantageous to arouse the elementary pupil's attention and interest by introducing the subject in a more concrete way than by dealing first and solely with the broad abstract principles of the science. If the student can be brought, in even a few instances, to appreciate the fact that these abstract principles are generalizations based upon and explaining familiar occurrences and problems of economic life, he will be made more willing to deal with the sometimes dry and unattractive, but inexorable, economic laws. Consequently the more recent text-books generally approach the real body of economic theory through introductory matter of some one of the following forms: (1) By a summary sketch of the main steps through which the familiar present economic organization has developed from the simple economic life of primitive man (*e. g.*,

Blackmar's Economics, Ely's Outlines of Economics); (2) by a brief sketch of the economic history of the last century or two, thus showing more concretely than in the preceding, but for a briefer period, the evolution of existing economic conditions (*e. g.*, Seager's Introduction to Economics, Bullock's Introduction to Economics, Thurston's Economics and Industrial History); (3) by a sketch of the scope and method of economic science, or of the fundamental concepts and forces of economic life, or of the development of economic thought, sometimes in connection with economic history (*e. g.*, Newcomb's Principles of Political Economy, Seligman's Principles of Economics, Blackmar's Economics, Devine's Economics, Davenport's Outlines of Economic Theory); (4) by raising problems that have puzzled the pupil, or by calling upon him to explain facts so familiar as to have been overlooked. Some of the text-books use a combination of two or more of the above forms of introductory material. Each of these forms of stimulating the pupil's attention and effort may be used to advantage, but probably the third is least promising for elementary students. The fourth may often be very helpful for this grade of students, but the teacher will be obliged to work out such a form to fit the environment and conditions of his own classes. He may find helpful suggestions, however, in Clow's Introduction to the Study of Commerce (Silver, Burdett & Co., \$1.25); and perhaps also in Taylor's Economics of Agriculture (The Macmillan Company, \$1.25), or in Fairchild's Agricultural Economics.

**THE TEACHER.** The method, however, will be of slight importance as compared with the teacher. A thoroughly good teacher will succeed with any method. The method can be no more than an aid to the teacher. First of all, the teacher must have an interest in the subject and a knowledge of it. "It should be taught by some one who knows a great deal more about the subject than he could possibly tell to his students." A teacher must have a knowledge exceeding the limits of the class text. The related fields of history and political science furnish much to better equip the teacher of economics, but especially important to him are a knowledge of economic history, especially of England and the United States, and of the history of economic thought. Only those who are familiar with these subjects can fully appreciate the frequency with which greater force and clearness are given to an economic principle by an historical instance in which its operation has clearly appeared. None but those who have some acquaintance with the development of economic thought can understand how important it is toward fully understanding and explaining economic principles as held at present.

**EQUIPMENT.** Works of reference for collateral reading are of great importance for both teacher and pupil. As the school and public libraries are generally deficient, especially in this important subject, it is desirable that extra effort be made to provide at least a few of the best works on economics. Care should be exercised in choosing these in order that not only the older writers may be represented, but also the numerous recent writers who give newer forms of expression to the old theories. Preference should be given, in getting together a school library, rather to more extensive and thorough works than to other brief works similar to the text-book, in order that the inquiring student may find in the library fuller and more satisfying information instead of merely a restatement of what the text has given him. Other works than treatises on economics should be at hand. Many governmental publications are very useful in this field. The books needed will differ somewhat according to the way in which the teacher treats the subject. Many of the treatises give bibliographies. One of the best recent lists of references may be found in Seligman's *Principles of Economics* (Longmans, Green & Co., New York, \$2.25). The University will gladly advise teachers in this matter, if requested.

**THE COURSE.** After an introductory portion of one sort or another, as suggested above, chosen by the teacher to suit his interests and abilities and those of his pupils, the subject may be divided into the following main portions. Their order is subject to some degree of variation, different writers and teachers differing slightly as to the preferred order of treatment. In an elementary course it seems desirable to give very brief consideration to some portions of the subject, and to concentrate attention on some of the more pressing or more familiar portions, not only as a means of stimulating the pupil's interest, but also for the purpose of training him to close consecutive thinking on economic topics.

1.—*Consumption.* In the complete outline presented below, consumption is the first topic, although many teachers prefer to begin with production, as was, indeed, the earlier teaching practice of the writer. Man puts forth his efforts in order that he may in some way procure things to satisfy his desires for food, clothing, recreation, and many other sorts of wants. Hence, consumption, the process of obtaining such satisfaction, seems the fundamental consideration—the motive of all economic action. Human wants, their variety, their constant development and extension, their significance as indices of civilization, furnish a familiar, although little considered point of entrance for the pupil.

From the classification of these wants those of distinctly economic character are brought forth as the basis of this study. A clear presentation of just what economic consumption is and what it should be brings up the numerous problems of saving, luxury, waste, and the proper relation of consumption and production. Understanding the aim or motive, the pupil is prepared to go on to the consideration of the means by which the consumption is made possible, viz., production.

2.—*Value.* But before taking up production, the teacher may choose to briefly consider the fundamental principles of value. The reasons for this are: first, that value, according to the now universally accepted marginal utility theory, is the outcome primarily of human economic wants, and so can most clearly be treated in close connection with those wants; second, that the principles of value are so frequently referred to throughout the study of economics as to make the postponement of their elucidation extremely inconvenient to both teacher and pupil. A more exhaustive consideration of value may be taken up later, if desired.

3.—*Production.* The true nature of production and its difference from mere acquisition furnish a ready means of emphasizing the general social point of view, a most important step toward the betterment of many present abuses, and toward the growth of a better spirit of citizenship. The part played in production by land or nature, by labor or man, by capital, and by management, a special form of labor, as well as by other forces, such as social and political organization, should be clearly brought out, in order that the future citizen and business man may correctly appreciate the importance of each and of right relations between them. A study of the various main forms or classes of production, with the differing importance of the factors in each, will greatly help the pupil toward broader and fairer views than those likely to arise from his associations and individual interests.

4.—*Distribution.* This, the most complicated and difficult of the divisions of Economics, will probably have to be treated briefly and incompletely in the high-school course, but the teacher may at least make sure that the problems are clearly presented to the pupil's mind if not entirely solved. That the present problems of distribution are more than mere matters of exchange and transportation should be clearly grasped by the teacher and as clearly impressed upon his pupils. Consequently the questions of rent, wages, interest and profits must be carefully discussed, if not fully disposed of. Attention may also be profitably called to the great influence of social law, custom, and organization in this field. Ex-

change, with its various organizations, forms and methods—transportation in its present and growing importance, the mechanisms of trade, money and credit, the important institutions of banking, domestic and foreign trade—all offer material for profitable study. In beginning the consideration of exchange some teachers find it advisable to give fuller consideration to the principles of value, but this seems of doubtful advisability in the high school.

Many problems of general or local interest, such as irrigation, improved roads, agricultural methods, the tariff, various other taxes, the economic functions of various grades of government, labor organizations, monopolies, socialism, and numerous others will present themselves from time to time. They should not be permitted to absorb attention to the exclusion of the principles upon which right judgments concerning them must be based, nor should they be hastily or unwisely excluded from consideration. The teacher's judgment will find abundant exercise in determining the attention due them. Such subjects may generally be treated most satisfactorily in connection with that portion of the course to which they are most intimately related, and indeed they are likely to present themselves in such connection.

The following outline is suggestive of a year's work in the ordinary high school. The first part in industrial evolution should occupy about one-fourth of the time. This is the work covered by Ely's or Blackmar's *Economics for High Schools*. Every teacher should have at his command a few books that treat the subjects more fully than are found in the works named above, but which are too difficult to be used as text-books. The following carefully selected books will answer the purpose:

*Industrial Evolution*, by Carl Bücher.

*Evolution of Industrial Society*, by Richard T. Ely.

*The Races of Man*, by J. Deniker.

*The Industrial and Social History of England*, by Edward P. Cheyney.

*The Principles of Economics*, by E. R. A. Seligman.

*The Principles of Economics*, by Frank A. Fetter.

*Money and Banking*, by William A. Scott.

*The Labor Movement in America*, by Richard T. Ely.

*The Trust Problem*, by J. W. Jenks.

*Taxation in Modern States and Cities*, by R. T. Ely.

*Economics (for colleges)*, by F. W. Blackmar.

**A. Industrial evolution.****I. Primitive industrial relations.**

Occupations of primitive man.  
Methods of obtaining food.  
The production of clothing.  
The method of building houses.  
The manufacture of ornaments.  
The manufacture of implements and utensils.  
The division of labor.  
The artisan class.  
The care of stock.  
The beginning of agriculture.  
Trading and transportation.  
The ownership of property.  
Irregular development of economic life.

**II. Early family history.**

Beginnings of economy.  
Ancient family life.  
The enlarged family.  
The introduction of slavery.  
Consumers' economy.  
Beginnings of state economy.

**III. Early medieval organization.**

Rise of feudal society.  
Economic organization founded on the prevailing land system.  
The manorial system.  
Classes of laborers.  
Division of labor.  
Commerce.  
Industry.  
The wage-work system.  
Handcraft industry.  
Industrial transition.

**IV. Later medieval development.**

Transformation of the household and the manor.  
The rise of towns.  
Independent town economy.  
The industrial classes.  
The guilds.  
Craft guilds.  
Piece-work or the handcraft system.  
The development of trade.

A. Industrial evolution—*continued*:

## V. From handcraft to power manufacture.

Self-sufficiency of the home declines.

The decline of handcraft through increased demand for goods.

Hand-work supplanted by machinery.

Influence of mechanical inventions.

Agricultural changes.

## VI. Industrial revolution.

The effects of power manufacture.

The factory system.

The effects of factory life.

Theory of non-interference with economic production.

The development of political economy.

Reaction from the non-interference policy.

Labor organization.

Conditions in the United States.

## VII. Commercial development.

Trade among primitive peoples.

Commerce of ancient nations.

The Phœnicians were masters of commerce.

Medieval commerce.

Nature of medieval commerce.

Modern commerce.

The mercantile system.

National competition.

The French and the English.

Recent commerce.

American carrying-trade.

Development of American commerce.

Causes of commercial success.

Principles of international trade.

## VIII. Modern industrial life.

The competitive life.

The coöperative life.

The influence of modern invention.

Relation of scientific discovery to industry.

Transportation.

Communication.

Organization of industry.

Corporations and trusts.

Labor organization.

Organization of finance and trade.

A. Industrial evolution—*continued*:

VIII. Modern industrial life.

- The social condition of the laboring population.
- The shadow of great wealth.
- The relation of industry to politics.
- The social paradox.

B. Private economics.

(a) Consumption.

I. The satisfaction of economic wants.

- Human desires the foundation of economic society.
- The effect of the desire for food.
- The desire for clothing and shelter.
- The home life.
- The desire for education.
- Desire for religious culture.
- The demand for wealth.
- The demand for social order.
- Consumption of economic goods makes a demand for their production.
- Interdependence of economic society.

II. Nature of consumption.

- Consumption regulates production.
- Consumption inseparable from production.
- Variety of human wants.
- Degree of want.
- Satisfaction of economic wants.
- Immediate consumption and final consumption.
- Productive consumption.
- Consumer's profits.

III. Consumption and saving.

- Analysis of consumption.
- Engel's law.
- Inducements to save.
- Spending and saving.
- Economic expenditure and waste.
- The desirability of saving.
- National consumption.
- Reform in consumption.
- Sweating system.
- Waste in consumption.

(b) Factors and processes of production.

I. The nature of production.

- Unity of the economic process.

B. Private economics—*continued*:

## (b) Factors and processes of production.

## I. The nature of production.

Character of production.

Creation of wealth.

Who are producers?

Nature of wealth.

Various methods of creating wealth.

Different ways of creating value.

Various processes of production.

Essential factors of production.

Conditions of wealth-producing.

Means of increasing production.

## II. Land as a factor in production.

Land or nature the first consideration.

Bountifulness of nature.

Offices of land.

Civilization and the land question.

Population and land.

Laws of income from agriculture.

Industries of limited returns.

Extension of territory.

Land area.

Transportation and agriculture.

Policy of the United States.

Monopoly in land.

Agricultural area in the United States.

Variety of agricultural products.

Economic effect of machinery.

Corporate farming.

The effect of irrigation on prices.

General results of irrigation.

Forests and fisheries.

Land tenure.

## III. Labor as a factor in production.

Services of labor.

Extent of the labor force.

Quality of the labor force.

Various grades of labor.

Division of labor.

Cooperation of labor.

Labor has thus continually increased its productivity.

Improved condition of labor.

B. Private economics—*continued*:

(b) Factors and processes of production.

III. Labor as a factor in production.

Protection of labor.

Eight-hour law and its effect on production.

Restriction of immigration.

Nature of capital.

Saving and abstinence.

Fixed capital and circulating capital.

Specialized and free capital.

Pure and concrete capital.

Accumulation of capital.

Momentum of capital.

Economic significance of capital in production.

IV. Production influenced by social organization.

Private organization.

Firm or partnership.

The corporation.

Trusts and combinations.

Effect of organized labor on production.

Effect of political organization on values.

Increased productivity on account of organization.

(c) Distribution.

V. Principles of distribution.

Net product.

Nature of distribution.

Divisions of net product.

Undivided net product.

Law of equal returns.

Dynamic law of distribution.

How the gross product is distributed.

Rights of property.

Monopoly privileges.

VI. Rent as a factor in distribution.

Rent in general.

Contract rent and economic rent.

Cause of rent.

Manner in which rent arises.

Difference in the fertility of soil.

Favorable location.

Limited returns to agriculture.

Margin of cultivation.

Prices of rent.

B. Private economics—*continued*:

## (c) Distribution.

## VI. Rent as a factor in distribution.

Rent does not enter into the cost of production.

Rent and free land.

Economic significance of rent.

## VII. Wages as a factor in distribution.

Labor the cause of wages.

Real and nominal wages.

Wage-fund theory.

Determination of the rate of wages.

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Iron law of wages.

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Competing groups.

Influence of labor organizations on wages.

Business sense and wages.

Philanthropy and wages.

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Gradual increase in wages.

Improvement of wages by legislation.

Economic signification of wages.

Nature of interest.

Economic interest and loan interest.

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Interest a premium on exchange.

Rate on loans.

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Legislation and interest.

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## VIII. Profits.

Gross profits.

Pure profits.

Competition and profits.

The managing class.

Profits and rent.

Pure profits and market prices.

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Trading power as a factor in distribution.

## IX. Coöperation and profit-sharing as processes of distribution.

Nature of coöperation.

Distributive coöperation.

B. Private economics—*continued*:

(c) Distribution.

IX. Coöperation and profit-sharing as processes of distribution.

Productive coöperation.

Distributive coöperation in England.

Productive coöperation in England.

Coöperation in the United States.

Aim of coöperation.

X. Labor organizations.

Origin of labor organizations.

Development of trade-unions.

Knights of Labor.

Objects of trade-unions.

Mistakes of unionism.

Result of strikes.

Influence of trade-unions on wages.

Effectiveness of labor organizations.

Arbitration and conciliation.

XI. The doctrine of socialism and the present economic system.

The claims of socialism.

The adjustments of social order.

Thomas More.

Modern communism.

Etienne Cabet.

Modern socialism.

Fourier.

State socialism.

Anarchism.

Recent socialism.

Socialism in America.

Characteristics of socialists.

Inadequacy of socialism.

Socialism does not insure equality.

No formula for reform.

(d) Value, money and exchange.

I. Utility and demand.

Struggle for wealth.

Utility.

Demand schedule.

Law of demand.

Market demand.

Competition and demand.

B. Private economics—*continued*;

## (d) Value, money and exchange.

## II. Value.

Definition.

Differences of opinion.

Free goods and economic goods.

Value and index of utility.

Theories of the cause of value.

Utility the cause of value.

Objective and subjective value.

Intrinsic value.

## III. Price.

Definition.

Manner in which market price is established.

Market interferences.

Normal price.

Limitation of prices.

## IV. Money.

Beginnings of exchange.

Early history of money.

Kinds of money.

Functions of money.

Measures of value.

Standard of value.

Deferred payments.

Multiple standard.

Storage of value.

Principles of circulation.

Amount of money needed by a nation.

Monometalism.

Bimetalism.

Paper money.

Paper money and bank notes.

Monetary history of the United States.

## V. Credit and banking.

Definition of credit.

Instruments of credit.

Credit and value.

Advantages of credit.

Credit creates capital.

Effects of overstrained credit.

Inflation of the currency.

Banks as centers of business.

B. Private economics—*continued*:

(d) Value, money and exchange.

V. Credit and banking.

Rise of banking.

What constitutes a sound banking system.

Bank of England.

Bank of France.

National banks of the United States.

Organization.

Regulation.

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Savings banks.

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VI. Process of exchange.

Organization of exchange.

Importance of exchange.

Means of exchange.

The market.

Domestic exchange.

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International values.

Balance-of-trade theory.

C. Public economics.

I. Government restriction and control.

Significance of public economics.

Free trade and free competition.

Views of early economists.

Modern restrictions upon industry and trade.

Plane of competition.

Government should realize to the people benefits of monopoly.

General management of industries.

Control of commissions.

Government ownership of railroads.

Laws controlling corporations.

Municipal ownership of gas-works and water-works.

Government management *versus* government ownership.

Disposal of public franchises.

Economic freedom demands restrictive laws.

The modern trust.

State socialism.

C. Public economics—*continued*:

## II. Taxation and revenue.

Relation of taxation to private economics.  
 Taxation a means of improving economic processes.  
 Definitions.  
 Purposes of taxation.  
 Canons of taxation.  
 Just and equitable taxation.  
 Incidence of taxation.  
 Classification of taxes.  
 Irregular development of finance and taxation.  
 Imperfections of modern taxation.  
 Methods of collecting revenues.  
 Double taxation.  
 Taxation of corporations.  
 Single tax.  
 Land and income tax.  
 Inequitable assessment.  
 Methods of collection.  
 Public expenditures.  
 The budget.  
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 Imperfections of government machinery.

MATHEMATICS. *Three units.*

The requirement in mathematics for admission to the College of Arts and Sciences, School of Law, School of Fine Arts, and School of Medicine of the University of Kansas, consists of one and one-half units of elementary algebra, and one unit of plane geometry. In the School of Engineering, an additional half-unit of solid geometry is required.

An additional half-unit of plane trigonometry and a half-unit of advanced algebra will be accepted by the University from such of its accredited schools as the High-school Visitor may certify are properly equipped to teach these courses.

Detailed accounts of the topics required and the suggestions as to the methods of teaching the various subjects are given below.

**ELEMENTARY ALGEBRA.** *One and one-half units.* The text-book in Algebra adopted for the use of the Kansas schools is Marsh's Elementary Algebra. Since this book contains a larger amount of algebra than the average class can master in a year and a half under present conditions, some portions of it must be omitted, and it becomes necessary for the University to specify defi-

nately just what portions may be omitted and just what portions must be mastered by the pupils in order to fulfill its requirements for admission.

The task is most easily accomplished by enumerating the paragraphs, exercises and chapters which may be omitted, and yet the pupils be fully prepared to enter the University classes. In this way the University lays down the essential things and the minimum amount of algebra which the preparatory schools must teach, but leaves them free to select such other topics as their time and local conditions may permit. But it is recommended that the high schools omit these designated topics and chapters from their course, and drill their pupils more thoroughly in the required topics.

These omissions and other suggestions are given in the following notes on the various chapters. Chapters not mentioned are to be taken entire, but no comments on them are deemed advisable.

*Chap. I.* Note.—This chapter is very easy, but no part of it ought to be omitted for that reason. Exercises I, II, III, and IV, especially, should be given careful attention.

*Chap. IV.* Note 1.—In this chapter, solve every problem and check the result. Less attention should be given to the axioms than to the process of verification, because the latter is the only certain test of the correctness of a solution. It should be made clear to the pupil that the solution of a simple equation means the finding of a value of the unknown which will satisfy that equation. Too often pupils have the notion that it means going mechanically through a certain regular process which at the end gives the “answer.” As Professor Heppel says: “A habit of constant verification cannot be too soon encouraged, and the earlier it is acquired the more swiftly and almost automatically it is practiced.”\*

Note 2.—Chapters I, II, III and IV are so elementary in their character and so suitable for younger pupils that they may well be taught in the grammar-school. The practical use and the disciplinary value of the methods of chapter IV are worth more to the pupil than all the compound proportion, bank discount, cube root, etc., that are contained between the covers of the old arithmetics. The notion that all problems in the schools and in school examinations should be “solved by arithmetic” is inexcusable pedantry.

*Chap. V.* Note.—In solving examples 4 to 9 inclusive, of exercise XXX, the use of parentheses in the first expansion, as illustrated in the type example just above the exercise, should be insisted upon.

*Chap. VI.* Note 1.—This chapter on factoring is of fundamental importance and should be thoroughly learned.

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\* Heppel, Algebra in Schools, in the Mathematical Gazette, February, 1905.

Note 2.—In connection with the factor theorem the solution of equations of higher degree than the first by means of factoring might well be introduced. One or two lessons devoted to such work would be profitable and would compensate the effort by added interest. Exercise CXIII, page 272, could be used at this point. Care should be taken to select only such equations as have all the roots real.

*Chap. VII.* Note 1.—This chapter contains two distinct methods for finding the highest common factor, and two corresponding methods for lowest common multiple. Case I, viz., the method by factoring, is the only one that the ordinary student of mathematics will ever be called upon to use in his subsequent work. This method is easy, and should be mastered.

Note 2.—The method given in articles 102 to 105 is out of place in a course in elementary algebra, for the following reasons:

(1) The proof of the method is too abstract and difficult for beginners, and is practically never mastered by them. Its proper place is in advanced courses of mathematics, in the University.

(2) The pupil does not need it in his subsequent work, and may pursue the science of mathematics to the end of his university course and never have occasion to use it except on artificial problems manufactured especially for the occasion.

Note 3.—Omit articles 102–105, exercise L, and article 109, exercise LII.

*Chap. VIII.* Note 1.—Omit example 3 of section 112, and examples 23–25 of exercise LIII.

Note 2.—Omit page 137, examples 12–15 of exercise LXII, and examples 27–37 of exercise LXIII.

*Chap. IX.* Note.—Omit articles 136 and 137.

*Chap. X.* Note 1.—For the work in graphs, paper ruled in quarter-inch squares and sold usually in local stores at five cents for a "Student's Note Book" of about fifty pages, will be found very satisfactory.

Note 2.—In teaching graphs the idea of locus should be emphasized. The pupil should learn to think of the graph as the path of a moving point which is restricted in its movement by the law stated in the given equation. In the development of the subject this is accomplished by making use of many questions similar to the following: "If a point be free to move except for the restriction that its  $x$ -coordinate shall always be equal to zero, where can it go?" "If a point be free to move except for the restriction that its  $y$ -coordinate shall always be equal to one, where can it go?" "If a point be free to move except for the restriction that its  $x$ -coordinate shall always be equal to its  $y$ -coordinate, where can

it go?" etc. By means of such questions the pupil is led to conceive of the graphs of the equations  $x=0$ ,  $y=1$ ,  $x-y=0$ , etc., as lines of indefinite length—a concept that is not so readily obtained in any other way. Again, emphasis of the locus idea gives the pupil power in seeing the relations of variables and the relative changes brought about by changes in the variables.

*Chap. XIII.* Note.—Do not spend much time on this chapter.

*Chap. XIV.* Note 1.—Special attention should be given to the binomial theorem contained in articles 172 and 173. Solve all of the examples in exercise LXXXVII. In solving these examples insist upon the use of parentheses in the first expansion as illustrated in the type form given above the exercise.

Note 2.—Omit articles 179 and 180. Special attention should be given to the finding of arithmetic square root, but no time should be wasted in introducing any work in cube root. The pupil will find out later that arithmetic roots higher than the second can be found much more easily by the use of logarithms.

*Chap. XV.* Note 1.—Omit examples 22-27 of exercise CIII, all of article 202, and examples 42 and 44 of exercise CVI.

Note 2.—In connection with exercise CV, it should be impressed upon the mind of the pupil that the new equation obtained by squaring or cubing the two members of a given equation will, in general, have roots that do not satisfy the given equation, and that, therefore, the checking of every solution is imperative. The author has wisely pointed this out on page 245 and in example 2 on page 246, and it is deserving of emphasis.

*Chap. XVIII.* Note 1.—Observe that emphasis is again laid upon the check in solving irrational quadratic equations.

Note 2.—The method of factoring should be presented early, in order to show the character of the problem and the existence of the two roots. The pupil should clearly understand that relatively few simple problems are solvable by the method of factoring.

Note 3.—In order to avoid confusion of methods, it is best that the beginner be taught but one method of completing the square of a quadratic equation. Experience has shown that the method of completing the square after dividing through by the coefficient of  $x^2$  is the easiest for the pupil to remember. This method should therefore be taught, to the exclusion of all others.

Note 4.—After the pupil has been thoroughly drilled in the above-mentioned method of completing the square, he should be taught the formula of article 225. He should be convinced by numerous examples that the quickest way to solve a quadratic equation is to use the formula. The pupil should habitually use the formula in his subsequent work whenever he has a quadratic equation to solve.

Note 5.—The clear understanding gained by the use of graphs more than compensates for the time required to learn the graphical method.

Chap. XIX. Note.—Omit articles 245, 246, 247 and 249, but be careful not to omit article 248.

Chap. XX. Note.—Solve every problem in this chapter except those (if any) which necessitate a knowledge of the articles omitted from the preceding chapter.

Chap. XXI. Note.—This chapter should be read in connection with pages 90–97 of book III of Phillips and Fisher's Geometry.

Chap. XXII. Note.—Omit articles 262, 265 and 270.

Chap. XXIII. Note.—Omit the entire chapter.

Chap. XXIV. Note.—If time permits, make use of examples 1–21 of exercise CXLV for practice. If not, omit the entire chapter.

Chap. XXV. Note.—Omit the entire chapter. This chapter should be studied in connection with the course in trigonometry.

PLANE GEOMETRY. *One unit.* The text-book in geometry adopted for use in the high schools of Kansas is Phillips and Fisher's Elements of Geometry, abridged edition. This text-book is so small and the number of exercises so limited, that all the book contains on plane geometry can easily be completed in one school year. Some schools and teachers will doubtless be able to complete books I–VI in one year, leaving books VII–IX to be completed in another half-year. The miscellaneous exercises on pages 333 and 334 should be taken in connection with the specific books they are intended to supplement, and not left until the end of the course. Exercises XLIX and LI (page 336) are not well suited to this grade of work and should be omitted.

One of the chief difficulties with which both teachers and pupils have to contend in the ordinary course in high-school geometry is that the pupils are called upon to acquire at one and the same time the elementary ideas of geometry, the terminology of geometry, and a knowledge of the nature and meaning of a logical proof. This difficulty would be largely overcome if these tasks were separated, so that the pupil could acquire his geometric ideas and vocabulary a year or more in advance of his undertaking the study of demonstrative geometry.

*Concrete Geometry in the Grades.* As long ago as 1892 the Committee of Ten, influenced by the mathematical curriculum of the schools of continental Europe, recommended that systematic instruction in concrete (intuitional, non-demonstrative) geometry be given in the grammar grades. (See the Report of the Committee of Ten.)

Besides the above-mentioned difficulty in the teaching of the ordinary course in high-school geometry, there are weighty reasons for the introduction of some elementary geometry in the grammar grades. A very large percentage of the children in these grades never reach the high school. From their ranks is largely recruited the army of mechanics and skilled laborers of all kinds. A knowledge of the simpler facts of geometry is extremely useful in after-life to large numbers of people of this class. The public-school system should therefore be adapted to their needs and they should be given an opportunity to acquire in their school days this useful knowledge.

Concrete geometry is in its nature less abstract than many of the arithmetical theories usually taught in these grades, and is therefore better suited to the immature minds of the pupils than the more difficult processes of analysis which make up so large a part of the course in arithmetic.

It may be objected that the above suggestions are innovations which are contrary to the traditional course in geometry in American and English schools; but the experience of continental Europe has established its practicability so thoroughly that its superiority to the common method cannot be denied. The same thing is being done in many schools in this country with absolute success.

A few words on the various methods of introducing this study into the grammar grades.

*Blocks and Models.* Mensuration is not the last topic that should be taken up in the course in arithmetic, but work on this subject should be carried on throughout the seventh and eighth grades. A good set of geometrical blocks and models can be used here with great profit to the pupils. Such a set can be purchased for a small amount. (One of the best sets on the market is sold by W. D. Ross, Fremont, Ohio, for \$12.)

The amount of geometrical knowledge to be acquired from such a set of blocks, or from the subject of mensuration illustrated by blocks, is a good preparation for high-school or demonstrative geometry.

*Geometrical Drawing.* Closely connected with concrete geometry on the one hand, and on the other associated with the manual-training idea, is the subject of geometrical drawing. This might be taken up in connection with the work in free-hand drawing or in manual training. All the essentials of the course in concrete geometry advocated above might be given in a course in geometrical drawing.

The necessary outfit is very simple; the pupil should provide

himself with a pair of compasses, a ruler, a protractor, and a small drawing-board. The following sample outfit will be found very satisfactory:

The Eagle compasses, No. 569, price twenty-five cents.

[ A hardwood ruler with inches and fractions on one edge and centimeters on the other edge, five cents.

A German silver protractor, twenty-five cents; paper ones, thirty cents a dozen.

The Springfield drawing kit, thirty cents. (Western agents, Hoover Bros., Kansas City )

■ Pupils soon acquire dexterity in the use of these simple tools, and through their proper use soon accumulate a large fund of useful geometrical knowledge.

*Problems of Construction.* These tools should be used in connection with the ordinary course in high-school geometry, no matter whether the pupils have previously learned their use or not. Every problem of construction in Phillis and Fisher's geometry should be carefully drawn on suitable paper, and as accurately as the tools at hand will permit. With the simple outfit described above a very high degree of accuracy may be obtained. It is not enough for the pupil to learn the theory of geometrical construction; he should also be taught how to apply the theory to actual practice. For example, it is not sufficient that the pupil be able to *tell* how to construct a square equivalent to the sum of two given squares, but he should be able to do it, and do it accurately and neatly. The accuracy of the result should be verified, whenever possible, by actual measurement. In the chemical or physical laboratory it is not regarded as sufficient that the pupils are able to tell how to do a certain thing; they must be able to do it. It should be the same in geometry.

*Text-books in Elementary Geometry.* There are a number of text-books in concrete geometry on the market intended for the use of pupils in the grammar grades; a few of these are mentioned here. These books may be obtained from the publishers. Baker's Elementary Geometry, Ginn & Co.; Nichol's Introductory Geometry, Longmans, Green & Co.; Hornbrook's Concrete Geometry, American Book Company; Campbell's Observational Geometry, American Book Company; Dodd and Chace, Elements of Algebra and Geometry, Kimberly Publishing Company, Kansas City, Mo.; Hailmann's Constructive Form Work, P. C. Burchard & Co., Boston, Mass.

The last one mentioned is the best for young children in the lower grades. Baker's little book is one of the best of its kind for

more advanced pupils, and is well adapted for the upper grammar grades of the first year of the high school.

**SOLID GEOMETRY.** *One-half unit.* Solid geometry, one-half unit, is required for entrance to the School of Engineering, but is not required for entrance to the College of Arts and Sciences. If not offered for entrance to the College, it must be taken in the Freshman year. All accredited schools teach solid geometry, and so it is recommended that, as far as possible, candidates for admission to the College offer solid geometry for entrance.

All of Phillips and Fisher's Solid Geometry, including the miscellaneous exercises at the end of the text, must be taken by the pupil in order to meet the requirements for entrance to the School of Engineering.

In connection with the course in solid geometry the use of blocks and models is urged, and accurate drawings should be strongly insisted on. In this connection it will be found useful to have the pupils construct cardboard models of as many of the solids studied as is possible. Patterns for a large number of these models are to be found in Campbell's Observational Geometry (American Book Company).

#### FOURTH-YEAR MATHEMATICS.

At present only a few high schools in Kansas give courses in trigonometry or college algebra. Hereafter plane trigonometry and college algebra, one-half unit each, may be offered for entrance and counted among the fifteen units required for entrance. It is expected that this privilege will stimulate most of the stronger high schools of the state to introduce these courses into their curricula. Where both are taught, trigonometry should precede college algebra.

**PLANE TRIGONOMETRY.** *One-half unit.* Ashton and Marsh's Trigonometry is used at the University as the text-book for this course, and in amount of work and order of treatment the course in the high schools should conform to the plane trigonometry (pp. 1-115) of the above-named text-book, except that sections 24 to 28, inclusive, may be omitted. An equivalent amount of work taken from any standard text will be acceptable.

It is of fundamental importance that pupils obtain clear ideas of the trigonometric functions when they are presented. For that reason there should be some work with ruler and protractor at the first of the course. For example, to begin the course, develop by comparison of similar triangles the fact that in any right triangle the two acute angles and the six ratios of the sides are eight quantities so related that if any one of them is given the other seven are fixed. Pupils should then be given exercises in finding by ac-

tual measurement the ratios when an angle is given, and the angles and the other ratios when one of the ratios is given. They should next construct angles varying by five degrees from zero to ninety degrees and determine by measurement the approximate values of their trigonometric ratios. It will be found helpful to make the constructions upon squared paper. The results should be tabulated in the form of a table of natural functions and handed in for the instructor's examination. A reasonable amount of such work will be found very profitable.

It should be made clear to pupils that the use of logarithms is not *necessary* for the solution of trigonometrical problems, but that it is for convenience. They should be led to see that the use of logarithms, by substituting addition and subtraction for multiplication and division, economizes both time and labor. Problems, therefore, should be solved by use of the tables of natural functions before logarithms are introduced. The study of the theory and use of logarithms should be taken up in connection with the trigonometry at the time it is needed.

COLLEGE ALGEBRA. *One-half unit.* The term "college algebra" in the past has stood for the most indefinite thing in the whole mathematical curriculum of American schools. The list of subjects in the various text-books on college algebra bear evidence to the same fact. The recent action of the joint committee mentioned in the University catalogue under "Entrance Requirements in Mathematics" has done much to standardize this course.

A half-unit of college algebra, to be accepted by the University, must conform as closely as possible to the outline printed in the University catalogue. The topic, *permutations and combinations*, may be omitted at the discretion of the teacher. All subjects involving infinite series should be omitted and the stress chiefly placed on complex numbers, determinants, the theory of equations, and their application.

In the solution of numerical equations, the roots should be located by means of the graph and their approximate values found by Horner's method. Sturm's theorem should not be given. The algebraic solutions of the cubic and quartic may be included if time permits, but they are not required.

GENERAL REMARKS. The modern tendency in mathematical instruction in secondary schools of the country is toward unification of the various branches of the science and its correlation with allied sciences. The teacher should always hold in mind that arithmetic, algebra and geometry are not separate sciences, but closely connected branches of one science, viz., mathematics. The arithmetic,

algebra and geometry should be intermingled as intimately as possible. Many problems of algebra should be geometrical in character, and many problems in geometry should be solved by algebra. The unity and not the divergency of the science should be emphasized. In the high-school course mathematics and physics have contact at many points, or, rather, they interpenetrate each other in many regions. Both should be taught in such a way as to emphasize this relationship.

The order in which the subjects are taught must be governed by local consideration. As matters now stand in most Kansas schools, it is believed that the best temporary arrangement is as follows:

First year.—Algebra to quadratic equations or thereabouts.

Second year.—Plane geometry.

Third year.—Algebra with required work completed, and solid geometry.

Fourth year.—Plane trigonometry and college algebra.

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**High-School Manual,**  
**No. V.**

**Report on High-School Visitation.**



**Submitted to the Board of Regents,**  
**November, 1908.**

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**Submitted to the Board of Regents,  
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## Introduction.

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*To the Honorable Board of Regents, University of Kansas:*

I have the honor of submitting herewith my report on high-school visitation.

The subject-matter of this bulletin, while general in nature, falls somewhat naturally under two divisions. The first part includes a list of accredited schools for the year 1908-'09, and, in addition to this, some information, statistical in nature, which has been collected, summarized and presented in tabular form. Part second includes (*a*) notes on laboratory work in biology, with special reference to the preparation and subject-matter of the note-book; (*b*) some definite advice on the teaching of English in high schools, emphasizing the importance of the proper kind of composition work; (*c*) a general list of books from which selection may be made for high-school libraries.

The notes on science work and English are supplementary to the definitions of units found in the High School Manual, No. IV. The list of books is offered here in response to numerous inquiries for advice in regard to what books should receive first consideration in building a working library for the high school, and it is hoped that this incomplete list will serve to answer these questions.

For the notes on science work I am under obligations to Prof. W. C. Stevens, of the Department of Botany, and Prof. C. E. McClung, of the Department of Zoölogy, at the University of Kansas; for the suggestions on composition work, I acknowledge my obligations to Prof. E. M. Hopkins, also of the University.

This bulletin has been prepared for general distribution and will be mailed free to any address. Any person desiring a copy should write either the Registrar or the High-school Visitor.



# Part I.

## List of Accredited High Schools.

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A high school, in order to be fully accredited by the University, should maintain a four-year course of study which provides for fifteen units of work prescribed for entrance to the Freshman class. When this information is sent to the University on a blank furnished for the purpose, the High-school Visitor examines the school, and, if the instructors are qualified, the departments well equipped and other conditions favorable, the school is placed upon an accredited list. Graduates of approved schools are admitted to the Freshman class of the College without examination, provided they are recommended by the principal, and provided also they present to the registrar a complete transcript of their preparatory work, as required for College entrance. The University supplies the blanks for this purpose.

Schools which find it impossible to carry the full amount of work required for College entrance may be partially accredited in case the course of study provides for at least twelve units of prescribed work, including three years of English, three years of Latin or German, and two and a half years of mathematics. Schools thus classified are placed in a special list and credit is given for all prescribed work recommended by the High-school Visitor. In addition to the preparatory units certified to by the high-school principal or superintendent, each student is also required to send by mail, or present in person when coming to the University, his note-books in physics, chemistry, botany, and zoölogy. This is in accordance with the unanimous request of the science teachers of the state who were in attendance at the conference of high-school teachers held at the University April, 1907. Great difficulty has been experienced by teachers in the high schools in their efforts to secure the proper kind of laboratory work; sometimes it is because of inadequate facilities, again it may be because of inexperience; hence the chief motive in making this requirement is not so much to estimate the ability of the pupil as to enable College instructors of these subjects to render more efficient service to the high schools by wholesome criticism and expert advice. There is no doubt but

that much time is being wasted in so-called laboratory work, mainly from the fact that the inexperienced instructors fail to comprehend the real purpose of the note-book and the best methods of conducting the class. The note-book is a very good index of the work accomplished by the individual members of a class, and if the drawings and notes contained in them are neatly executed and accurate, will reveal to the College teacher at once that the character of the work done is of a high order. These note-books will be examined by the departments represented, and the owners may secure them by calling for them any time after the first month of the school year.

In classifying the accredited schools of the state one is compelled to follow arbitrary rules to a certain extent. While it is results that count above all things, we cannot always make this fact prominent in a classification. Arranging these schools in three divisions, we have observed, as far as practicable, the principles laid down in High-School Manual No. IV for the accrediting of schools—rules which are so familiar to teachers now that it is useless to repeat them here. By a careful survey of these lists it will be noticed that a number of changes have been made. Fifty-two more schools are found upon the *first* list this year than at any previous time. The number classified in the fully accredited list of high schools for the year 1908-'09 is 133, while only 81 were thus classified in the year 1907-'08. One hundred and thirty-three high schools, therefore, practically fulfill all the conditions for accredited relations. In a very few cases there is a slight deviation from the standard; a few schools yet permit a teacher to carry as many as seven recitations per day. It might also be stated that in a few cities the need for more room and better building facilities have been a hindrance to the proper development of good high-school conditions. Only one school in this list has less than a nine months' term, but other requirements are so satisfactorily met that it was thought best to leave the school in the first list.

Seventy-seven high schools have been placed in class II. Many of these, receiving county aid under provisions of the Barnes law, are growing very rapidly, and it will not be long until the best conditions will be realized. In fifty-nine schools there are only two teachers in each devoting full time to secondary subjects; in the remaining eighteen three teachers are employed. The instructors are in many cases required to carry too much work; in fourteen schools the term is shortened, and in the majority of them the facilities for laboratory work are inadequate and the libraries are far from satisfactory. All of the schools in this list offer as a mini-

mum twelve units of accredited work, and while a large per cent. of them are carrying fifteen units prescribed for entrance to the College, all the conditions are not such as would warrant the University in approving the same without some reservations.

The third class consists of nineteen schools, only six of which the High-school Visitor has been able to inspect. Fifteen of these have two students or less enrolled in the fourth year. Many of them are preparing to participate in the Barnes-law fund, and will meet the requirements at the end of the present year. These schools are usually located in small villages, with a very small attendance, many of them having not more than three years of work represented in their daily program. In many cases one teacher is giving full time to high-school work, while a second teacher devotes a portion of the time to the upper grades. It is quite common to enroll the seventh and eighth grades in the high-school department and to employ two instructors, only, to conduct all classes scheduled in both programs. A small laboratory equipment has been installed in some of these schools and a few of them have fairly good reference libraries, but they have not yet reached a standard of work which should be approved by the University as meeting the standard for entrance to College.

The intention is to inspect all of these schools during the current year, and it is hoped that school authorities will continue to work for better conditions by adding to the libraries and other teaching facilities. Before Class III is advanced to a higher rating, the enumeration, as well as the high-school enrolment, should be large enough to give promise of permanent organization and growth. Other facts of minor importance, much too numerous for consideration in this connection, may be learned by consulting the tables of this bulletin.

### CLASS I.

Schools found in this list are fully accredited.

<i>Name of school.</i>	<i>Superintendent.</i>	<i>Principal.</i>
Abilene.....	W. A. Stacey, B. S.....	J. A. Redfield, A. B.
Alma.....	E. B. Gift, A. B.....	
Altoona.....	H. C. Duckworth.....	Jennie Salisbury.
Anthony.....	J. H. Clement, A. B.....	T. E. Wilson, A. B.
Argentine.....	H. P. Butcher, A. B.....	Minnie J. Oliverson, A. B.
Arkansas City.....	John F. Bender, A. B.....	J. W. Murphy, A. B.
Atchison Co. (Effingham).....		E. H. McMath, A. B.
Atchison.....	N. T. Veatch.....	A. H. Spear, A. B.
Attica.....	P. N. Heck.....	
Augusta.....	Chas. W. Pratt.....	
Axtell.....	S. L. Soper, A. B.....	R. T. Kersey, B. S.
Belleville.....	G. W. Kleihege, B. S.....	W. A. Cain.

<i>Name of school.</i>	<i>Superintendent.</i>	<i>Principal.</i>
Beloit.....	J. O. Hall, A. B.....	T. P. Downs.
Blue Rapids.....	C. C. Brown, M. A.....	H. W. Cornell, A. B.
Bonner Springs.....	Herman Pfeifer, A. B.....	
Bronson.....	C. M. Smith.....	Mrs. C. M. Smith.
Burden.....	N. H. Bartlett, B. S.....	
Burlington.....	Inez M. Chapman, A. B....	Maud G. Neyhart, A. B.
Burlingame.....	C. A. Deardorff, M. E.....	Grace Brigham, M. A.
Burton.....	H. J. Davis.....	Helen Kinzer, A. B.
Caldwell.....	D. C. Porter, A. B.....	Josephine Hoge.
Chanute.....	Homer S. Myers, M. A.....	J. A. Cannon.
Chase Co. (Cottonw'd Falls), .....		B. F. Martin.
Chelsea (Kansas City, Kan.), .....		W. J. McCarty, LL. B.
Cheney.....	C. A. Mahin.....	
Cherokee Co. (Columbus) ..		M. L. Catlett.
Cherryvale.....	H. D. Ramsey .....	N. A. Baker.
Clay Co. (Clay Center).....		E. B. Allbaugh.
Clyde.....	C. M. Ware.....	Mabel G. Feely, A. B.
Coffeyville.....	Wm. M. Sinclair.....	Chas. D. Ise, M. A., LL. B.
Concordia.....	A. F. Senter, B. S.....	Ray Green, B. S.
Council Grove.....	S. D. Dice, A. B.....	Lillian M. Hawkins.
Crawford Co. (Cherokee) ..		W. S. Pate.
Decatur Co. (Oberlin).....		A. I. Clow, A. B.
Dickinson Co. (Chapman) ..		J. P. Perrill, B. P.
Dodge City.....	S. V. Mallory, A. B.....	J. E. Coe, A. B.
Douglass.....	J. E. Cook.....	John Hill, A. B.
El Dorado.....	Warren Baker.....	C. F. Smith, B. S.
Ellsworth.....	O. J. Silverwood, A. B.....	C. O. Getty, A. B.
Emporia.....	L. A. Lowther, A. B.....	C. A. Wagner, A. B.
Enterprise Normal Acad'y, .....		John P. Koeller, M. A.
Eskridge.....	C. H. Landrum, M. A.....	Pearl Sanford, A. B.
Eureka.....	W. S. Robb.....	B. A. Green, Ph. B.
Fort Scott.....	D. M. Bowen.....	J. B. Stokesberry, A. B.
Frankfort.....	M. G. Kirkpatrick.....	J. J. Fowler.
Franklin (Kiowa).....	Ira Stout.....	Olla Cramer.
Fredonia.....	C. F. Daugherty.....	W. I. Matthews.
Galena.....	L. T. Huffman.....	R. R. Cook, A. B.
Garden City.....	G. E. Brown.....	E. J. Dumond.
Garnett.....	C. H. Oman, A. B.....	Bessie M. Kilbourn, A. B.
Girard.....	H. W. Shideler, A. B.....	Mabel Winger, A. B.
Gove Co. (Gove).....		F. E. Lindley.
Great Bend.....	D. F. Shirk, A. B.....	
Greenleaf.....	L. P. Wharton, B. S.....	Christina Nelson, B. L.
Halstead.....	C. O. Smith.....	B. P. Young, B. S.
Harper.....	A. L. Stickel, M. A.....	Margaret Howes.
Herington.....	A. J. McAllister, B. S.....	Imri Zumwalt, A. B.
Hiawatha.....	George G. Pinney, A. B....	Raymond G. Taylor, A. B.
Hoisington.....	C. E. Cannon.....	Virginia E. Coleman, A. B.
Holton.....	H. H. Van Fleet, A. B.....	H. W. Gowans, B. S.
Howard.....	H. I. French.....	Anna S. Lees.
Humboldt.....	A. I. Decker, B. S.....	W. L. Good.
Hutchinson.....	Richard R. Price, M. A....	W. C. Hutchinson, A. B.
Iola.....	L. W. Mayberry, A. B.....	L. H. Wishard.
Junction City.....	W. S. Heusner, M. A.....	S. J. Butts, M. A.

<i>Name of school.</i>	<i>Superintendent.</i>	<i>Principal.</i>
Kansas City .....	M. E. Pearson, B. D.....	J. M. Winslow, M. A.
Kingman .....	A. W. Ault, A. B.....	Charles A. Hall, A. B.
Kinsley .....	D. A. Baugher .....	.....
Labette Co. (Altamont).....	.....	I. M. Wood, B. S.
La Cygne.....	D. E. Conner.....	Junia Frazier, Ph. B.
La Harpe .....	A. J. Baker .....	F. M. Hyames.
Lawrence.....	F. P. Smith, M. A.....	F. H. Olney, A. B.
Leavenworth .....	George W. Kendrick.....	Belle Wittrock.
Le Roy.....	A. M. Hambleton, M. A....	Anna Van Vickle, Ph. B.
Lewis Academy (Wichita), .....	.....	R. S. Lawrence, M. A.
Lincoln .....	R. E. Long .....	Mary B. Nelson.
Lindsborg.....	I. C. Meyer.....	.....
Lyndon .....	J. E. Watson, A. B.....	Jessie Lamb, A. B.
Lyons .....	T. A. Edgerton B. P.....	Louis Ringwalt, B. P.
Mankato.....	F. W. Simmonds, M. S....	Maud Hulse, B. Pd.
Marion.....	C. E. St. John.....	Clara Morris.
Marysville.....	C. A. Strong.....	L. N. Wilson, A. B.
McPherson.....	C. W. Kline, A. B.....	Clinton Wright.
Medicine Lodge.....	D. W. Major, A. M....	Annie E. Bell, Ph. B.
Minneapolis .....	D. O. Smith, B. S.....	Benjamin S. Hill, A. B.
Montgomery Co. (Independence).....	.....	S. M. Nees, B. S.
Moran.....	J. W. Brown, LL. B.....	Hattie B. Maupin, A. B.
Neodesha .....	J. M. Steffen.....	Bessie G. Ryan.
Newton.....	L. J. Hall.....	S. N. Pett, A. B.
Norton Co. (Norton).....	.....	H. H. Gerardy.
Oakley.....	Maurice L. Smith.....	.....
Olathe.....	R. L. Parker, M. A.....	W. H. Eisenman, Ph. B.
Osage City.....	E. C. Hackney.....	Lambert Eidson, A. B.
Osawatomie.....	Floyd B. Lee.....	Frank McCune, A. B.
Osborne.....	R. K. Farrar, B. S.....	.....
Ottawa .....	A. L. Bell, M. A.....	R. E. Gowans, A. B.
Paola .....	F. K. Ferguson, B. S.....	C. H. Hepworth, Ph. B.
Parsons.....	J. A. Higdon, M. A.....	Louise M. Schaub.
Peabody.....	W. D. Ross, M. A.....	Daisy A. Spilman, A. B.
Pittsburg .....	A. H. Bushey, A. B.....	Robert E. Hartsock, B. S.
Plainville .....	G. A. Brown .....	Belle Lunden, B. S.
Pratt Co. (Pratt).....	.....	E. H. Ellsworth, M. A.
Rawlins Co. (Atwood).....	.....	C. W. McCormick, A. B.
Reno Co. (Nickerson).....	.....	E. B. Smith, M. A.
Rosedale .....	George E. Rose, B. S.....	Ava Douthart, A. B.
Russell.....	N. U. Spangler.....	Nellie F. Thomas.
Sabetha.....	Geo. T. Beach, M. A.....	J. W. Jones.
Salina.....	John Lofty, A. B.....	E. W. Pettibone, A. B.
Sedan.....	H. G. Adams, B. S.....	Ethel M. Childers.
Sedgwick.....	Robert N. Halbert, Ph. B..	Muriel E. Finn, A. B.
Seneca.....	R. G. Mueller, A. B.....	Pearl McCurdy, Ph. B.
Sheridan Co. (Hoxie).....	.....	H. C. Jent.
Sherman Co. (Goodland) ..	.....	E. E. Mitchell, Ph. B.
Smith Center .....	T. H. Hooper, A. B.....	Rose E. Hadden.
Southern Kansas Academy (Eureka) .....	.....	James F. Eaton, M. A.
Stafford.....	E. C. Kittell.....	Henrietta Hall.
Sterling.....	George L. Seeley, A. B.....	Jeanette M. Inches, Ph. B.
St. John .....	Charles M. Hilleary.....	Joseph H. Byers, A. B.

<i>Name of school.</i>	<i>Superintendent.</i>	<i>Principal.</i>
St. John's M. S. (Salina)...	Rev. Wm. N. Colton, A. B. ....	.....
Sumner Co. (Wellington) ..	.....	W. C. McCroskey, A. B.
Thomas Co. (Colby) .....	.....	J. E. Chamberlain.
Tonganoxie.....	Wm. G. Gambill.....	.....
Topeka.....	L. D. Whittemore, M. A. ....	H. L. Miller, A. B.
Trego Co. (Wa Keeney)....	.....	J. H. Niesley, A. B.
Troy .....	C. S. Hambleton.....	J. E. Brock.
Valley Falls.....	Harry McGuire .....	Maud Myers.
Walden Academy (McPherson).	.....	.....
Wamego.....	J. P. McCoy .....	Nellie C. Terrill.
Washington.....	W. D. Vincent, A. B. ....	J. F. Lewis, A. B.
Waverly.....	Z. E. Wyant.....	Charlotte Lewis.
Wichita.....	R. F. Knight, Ph. B. ....	I. M. Allen, LL. B.
Winfield.....	John W. Spindler, A. M. ....	J. W. Gowans, A. B.
Yates Center.....	I. C. Gregory, A. B. ....	Grace Melton, B. P.

NOTE.—Returns from the following schools reached us too late for classification in the above lists. They fulfill the conditions for accreditation and their graduates will be given entrance credit without examination: Sumner High School, Kansas City, Kan.; St. Mary's Academy, Leavenworth, Kan.; Oswego College Academy, Oswego, Kan.; Rossville High School; Lane County High School, Dighton, Kan.; Hiawatha Academy, Prin. I. A. Hoffman.

## CLASS II.

Schools listed in class II may fall short of full preparation by not more than three units.

<i>Name of school.</i>	<i>Superintendent.</i>	<i>Principal.</i>
Alta Vista .....	L. B. Burt.....	Anna G. Crouch.
Alden .....	H. H. Hildebrand, B. S. ....	Stella Dougherty.
Beattie.....	C. Kraemer.....	Elnora Stevenson.
Belle Plaine.....	Clarence Pearson, A. B. ....	Grace B. Muckle, A. B.
Blue Mound.....	A. E. Lunceford.....	M. Ellen Dingus, B. S.
Brookville.....	T. J. Rollman.....	Winnifred Martin.
Caney .....	R. Rankin .....	F. R. Aldrich, A. B.
Canton.....	W. H. Wolfe, A. B. ....	Luella Warren, A. B.
Carbondale.....	E. L. Heilmann.....	Mary M. Baird.
Cawker City.....	John Groendyke, B. S. ....	Euna Arrasmith, A. B.
Cedar Vale.....	O. D. Coover.....	Ada McClellan, A. B.
Centralia.....	E. C. Farrar.....	Ethel Keller, A. B.
Clearwater.....	R. M. Crum.....	Pauline Pampel.
Clifton.....	E. C. Montgomery, A. B. ....	Stella Wangerien, A. B.
Colony.....	John B. White.....	Grace Sutherland, Ph. B.
Coolidge .....	Arthur E. Solter, A. B. ....	.....
Delphos.....	H. W. Felter .....	Margaret Johnson, A. B.
Dixon Twp. (Argonia).....	A. G. Tritt, A. B. ....	Mr. Reece, A. B.
Downs .....	A. B. Dillon .....	Maud L. Soult.
Edwardsville.....	E. L. Thompson, A. B. ....	Katharine Schloz, A. B.
Ellinwood.....	H. E. Powers.....	Miss H. J. Minnis.
Ellis.....	B. E. Ford, B. S. ....	E. M. P. Hoar, A. B.
Elwood.....	B. G. Thayer.....	Anna Johnson.
Enterprise.....	H. B. Hungerford.....	Agnes E. Ekblad.
Erie.....	F. L. Pinet.....	Mary Roseberry.

<i>Name of school.</i>	<i>Superintendent.</i>	<i>Principal.</i>
Eudora.....	Charles Kelly.....	Mable Beard, A. B.
Florence.....	H. E. Clewell.....	Gertrude Doind.
Gas.....	Thomas E. Osborn.....	Leota Lieurance.
Glen Elder.....	R. L. Hamilton.....	Lulu Walton, A. B.
Gray County (Cimarron)...	O. B. Melia.....	Mabel I. Shoup.
Gypsum.....	Claude E. Tilford.....	Clara M. Speckmann, B. P.
Hartford.....	.....	Anna H. Brogan.
Harveyville.....	L. S. Runnels.....	Maude Marshall, A. B.
Hays.....	Lee R. Light.....	Annie P. Hopkins.
Hill City.....	F. E. Brown.....	Mary Davidson.
Hillsboro.....	A. B. Cope, M. A.....	Gertrude Walters, A. B.
Horton.....	W. W. Wood, A. B.....	Mabel O. Turner.
Irving.....	V. E. Worley, Pd. B.....	Mary Boal.
Jewell City.....	L. D. Griffiee.....	Hazel N. Berry.
Kincaid.....	J. L. Shearer, B. D.....	Daisy Newlon.
La Crosse.....	Sarah Squire, A. B.....	Nora Foraker, A. B.
Lansing.....	Ira J. Bright.....	Elizabeth Brown.
Larned.....	R. V. Phinney.....	J. L. Mickey.
Lebo.....	C. T. Sherwood.....	Zella W. Parker, A. B.
Lecompton.....	J. B. Wilson, A. B.....	Mary B. Maughlin, A. B.
Leon.....	Etta M. Marshall.....	J. Francis Emans.
Linwood.....	C. W. Ashbaugh.....	Elonon Sirplise, M. A.
Little River.....	C. W. Williams, A. B.....	Blanche Pilcher, A. B.
Logan.....	Cowles Wright.....	.....
Maplehill.....	J. H. Houston.....	Lillie Bernhard, A. B.
Marquette.....	.....	Guy H. Jaggard.
McLouth.....	W. T. King.....	Clara W. Carpenter, A. B.
Meriden.....	E. C. Pugh, A. B.....	Geraldine Stewart, A. B.
Moline.....	L. P. Breeden, A. B.....	J. W. Foster, B. O.
Mound City.....	V. E. Postma.....	Sophia Shauver.
Moundridge.....	G. Nyquist, M. A.....	.....
Nortonville.....	R. M. Davis, A. B.....	.....
Onaga.....	F. E. Robinson, B. S.....	Nellie McClure, Ph. B.
Oskaloosa.....	J. W. Roberts, A. B.....	Olive Collins, A. B.
Oswego.....	J. F. Lyon.....	Harriett Mahor, A. B.
Overbrook.....	I. T. Richardson, L. L. B. ..	Alise Widney, B. L.
Phillipsburg.....	Guy Warren, B. Ped.....	Jessie A. Gemmill, A. B.
Pleasanton.....	J. Van Arsdale, A. B.....	Eleanor Blakey, A. B.
Reading.....	.....	Ida L. Booth, A. B.
Savonburg.....	Charles Wright.....	Carrie Long, A. B.
Scranton.....	Thomas J. Carder.....	Laura L. Lux, A. B.
Summerfield.....	W. F. Clark.....	.....
Solomon.....	W. O. Steen.....	Irene Pemberton.
Stockton.....	R. Bullimore.....	Inez Ledyard, A. B.
Syracuse.....	H. E. Walter, A. B.....	Effie Markwell.
Valley Center.....	.....	Mrs. J. V. Colville, A. B.
Vermilion.....	.....	W. O. Peterson, B. S.
Waterville.....	G. H. Baird.....	Bertha L. Longley.
Wathena.....	.....	Chas. S. Todd.
Westmoreland.....	F. W. Comfort.....	Jennie P. Arnold, A. B.
Wellsville.....	B. W. Daily, A. B.....	Etta J. McCoy.
Wetmore.....	.....	George B. Neff, B. S.
White City.....	J. S. Stevenson.....	Ethel Moss.

## CLASS III.

Schools listed in Class III offer courses that have been approved by the University, but other conditions for accredited relations have not yet been entirely fulfilled.

<i>Name of School.</i>	<i>Superintendent.</i>	<i>Principal.</i>
Almena.....	R. M. Lockridge, M. S.....	.....
Barnard.....	J. W. Marston.....	John McBride.
Basehor.....	H. J. Alford, A. B.....	.....
Bunkerhill.....	Carl Ostrum, M. A.....	.....
Burr Oak.....	F. Eaton, B. S.....	Lulu Coyner.
Derby.....	J. W. Swaney.....	Erma Keister, A. B.
Glasco.....	J. M. Alcorn, B. S.....	.....
Havensville.....	Frank Broom.....	.....
Liberal.....	F. O. Rindon.....	.....
Lucas.....	I. E. Winchell.....	Cecil Scriven.
Norwich.....	F. S. Hagy, B. S.....	.....
Redfield.....	Edith McCarty, A. B.....	.....
Scott County (Scott).....	.....	Leola Strobe, A. B.
St. Marys.....	J. Merle Evans, A. B.....	Ida K. Moriarty.
Sylvan Grove.....	C. E. Lewellen, M. S.....	.....
White Cloud.....	Mr. Landrum, A. B.....	.....
Williamsburg.....	N. S. Welton.....	.....
Wilson.....	H. Coover.....	Amy Bordwell, A. B.

The number of schools affiliated with the University for the year 1908-'09 is fourteen less than the previous year. Ten schools located in Barnes-law counties applied for accredited relationship in 1907, but owing to the failure of this law to meet the required majority at the polls, the cost of expanding the work was found to be too heavy a burden on the district, and these schools failed to respond to our request for statistics for the present year.

Number of schools in accredited relations 1907-'08, 243.

Schools located in other states dropped, 5.

Kansas schools dropped, 9.

Schools failing to report, 10.

Total number dropped from accredited list, 24.

Number of schools continuing on the accredited list, 219.

Number of new schools added, 10.

Number of schools in accredited relations, 1908-'09, 229.

Since all states bordering on Kansas now have an officer of the State University known as the High-school Inspector, it was thought unnecessary to longer continue accredited relations with schools located in these states. The University of Kansas will give entrance credit to any student from another state who is a graduate of a high school accredited by the North Central Association of Colleges and Secondary Schools, and who can offer fifteen

units of prescribed work. The credits of graduates from other high schools will be accepted by special arrangement only. This statement explains why five Oklahoma high schools were dropped from our accredited list. It might also be well to announce that no school will be retained upon the accredited list which fails to furnish data upon the blanks furnished each year by the University.

Schools which have entered into accredited relations with the University for the first time this year are as follows: Barnard, Cedar Vale, Downs, Elwood, Enterprise, Liberal, Meriden, Vermilion, White City, White Cloud.

TABLE I.—ENUMERATION AND ENROLLMENT.

NAME OF SCHOOL.	Population of town.....	School enumeration.....	Total enrolment.....	High-school enrolment.					Number of teachers in high school...	Instructors with college degrees.....	Graduates of normal schools.....	Instructors with no degrees.....
				First year....	Second year....	Third year....	Fourth year....	Total.....				
Abilene.....	5,500	1,274	1,090	67	47	46	32	192	7	6	1	0
Alden.....	435	141	135	10	11	11	0	32	2	1	0	0
Alma.....	1,200	354	243	31	36	10	7	83	4	1	0	0
Almena.....	1,000	325	245	9	10	7	9	34	2	1	1	0
Alta Vista.....	443	182	149	14	2	5	1	22	3	1	2	0
Altoona.....	2,000	514	429	23	18	3	5	49	4	0	2	0
Anthony.....	3,000	829	690	43	37	29	15	124	5	5	0	0
Argentine.....	7,000	2,004	1,150	48	48	25	30	151	6	5	1	0
Arkansas City.....	8,000	1,944	1,355	76	51	20	25	172	7	6	0	1
Atchison County (Effingham).....	.....	.....	154	73	37	20	14	144	8	5	2	1
Atchison.....	15,500	4,177	1,901	82	41	18	26	167	7	6	1	0
Attica.....	1,200	200	230	25	20	3	7	57	3	2	1	0
Augusta.....	1,500	404	340	36	20	5	7	64	3	0	0	0
Axtell.....	800	290	24	21	18	14	9	62	3	3	0	0
Barnard.....	500	120	107	14	4	3	2	23	2	0	0	2
Baschor.....	300	100	120	4	4	2	7	20	2	1	0	0
Beattie.....	800	325	210	25	22	6	1	54	0	0	0	2
Belle Plaine.....	600	250	201	18	8	12	7	45	2	2	0	0
Belleville.....	2,500	715	560	46	28	19	18	111	4	1	3	0
Beloit.....	3,000	794	590	50	40	20	15	125	5	3	2	0
Blue Mound.....	623	161	140	10	9	7	3	29	2	1	1	0
Blue Rapids.....	1,900	.....	359	20	9	8	4	41	3	3	0	0
Bonner Springs.....	1,500	409	385	20	19	5	3	47	3	3	0	0
Bronson.....	720	175	200	28	16	8	7	59	3	0	2	1
Brookville.....	350	180	133	17	13	0	7	37	2	0	1	1
Bunkerhill.....	175	136	104	9	4	1	0	14	2	1	1	0
Burden.....	520	218	190	14	11	11	0	36	3	3	0	0
Burlington.....	2,200	687	451	49	7	7	6	69	5	5	0	0
Burlingame.....	2,000	625	550	35	22	20	14	91	4	2	2	0
Burr Oak.....	800	228	242	22	14	6	0	42	2	0	1	1
Burton.....	800	204	200	23	9	9	5	46	2	2	1	0
Caldwell.....	3,000	670	603	36	23	14	12	85	3	1	0	2

Caney.....	4,400	1,110	875	21	13	6	8	48	3	1	2	0	0
Canton.....	300	193	146	12	11	5	2	30	2	2	0	0	0
Carbondale.....	500	200	184	16	7	9	6	38	2	2	0	1	0
Cawker City.....	900	235	200	14	15	9	7	45	2	2	1	1	1
Cedar Vale.....	1,050	416	330	18	6	5	3	32	2	2	1	1	0
Centralia.....	1,000	300	211	20	17	10	8	56	3	2	1	1	0
Chanute.....	8,257	2,581	1,847	84	75	34	31	224	8	6	1	1	1
Chase County (Cottonwood Falls).....				20	40	21	12	114	3	3	2	0	1
Chelsea ( Kansas City, Kan.).....	2,100	830	630	46	30	22	14	112	5	5	0	1	0
Cheney.....	600	201	210	18	12	10	8	48	3	2	1	1	0
Cherokee County (Columbus).....				164	83	88	38	373	13	2	8	3	0
Cherryvale.....	6,500	1,390	1,100	51	26	24	13	114	4	2	2	0	0
Clay County (Clay Center).....	15,000	4,987	299	87	80	78	54	299	10	3	6	1	2
Clearwater.....	600	128	152	16	17	6	5	44	3	0	1	2	2
Clifton.....	800	246	194	28	6	9	2	45	2	2	0	0	0
Clyde.....	1,500	400	300	17	15	3	9	44	3	2	2	0	0
Coffeyville.....	18,000	3,600	2,575	88	66	33	38	225	10	3	5	2	2
Colony.....	900	225	192	29	19	12	7	67	2	1	1	0	0
Concordia.....	5,113	1,190	741	52	28	22	29	131	5	3	2	0	0
Coolidge.....	200	125	70	6	2	3	2	13	2	2	0	0	0
Council Grove.....	3,000	683	512	57	20	12	18	107	4	3	1	0	0
Crawford County (Cherokee).....				39	40	35	25	139	7	3	3	3	1
Decatur County (Oberlin).....				49	34	25	25	133	6	3	2	1	1
Delphos.....	800	247	178	15	8	6	0	31	2	1	1	0	0
Derby.....		135	125	12	4	1	0	17	2	1	1	0	0
Dickinson County (Chapman).....				151	58	50	38	191	8	3	3	2	0
Dixon Township (Argonia).....				17	7	6	4	34	2	2	0	0	0
Dodge City.....	3,000	715	736	43	24	20	26	113	4	4	0	0	0
Douglas.....	800	275	265	22	20	12	6	60	3	2	1	0	0
Downs.....	1,650	520	420	24	17	14	9	64	3	0	0	3	3
Edwardsville.....	250	163	125	15	9	1	1	27	2	2	2	2	2
El Dorado.....	4,000	962	820	86	30	24	29	169	8	3	3	2	2
Ellinwood.....	1,037	312	201	13	8	5	0	26	2	2	0	0	0
Ellis.....	1,250	426	272	13	10	9	7	39	3	2	1	0	0
Ellsworth.....	2,100	650	441	32	15	10	14	71	3	3	0	0	0
Elwood.....	846	324	213	4	5	1	1	14	2	0	2	2	0
Emporia.....	10,000	2,697	1,945	155	86	39	34	314	11	10	0	0	1
Enterprise.....	1,200	290	264	12	12	9	4	37	2	1	1	0	0
Enterprise Academy.....				15	12	15	8	50	4	4	0	0	0
Erie.....	1,500	400	350	16	13	15	8	41	2	1	1	0	0
Eske.....	1,000	250	220	45	10	14	6	86	4	2	2	0	0
Esksridge.....	1,900	251	210	21	5	5	9	40	4	2	1	0	0
Eudora.....	2,425	785	619	59	24	30	13	126	7	5	0	2	1
Eureka.....	1,400	660	318	30	7	4	7	48	3	0	2	0	2

TABLE I.—ENUMERATION AND ENROLMENT—Continued.

NAME OF SCHOOL.	Population of town.....	School enumeration.....	Total enrolment.....	High-school enrolment.					Number of teachers in school.....	Instructors with college degrees.....	Graduates of normal schools.....	Instructors with no degrees.....
				First year....	Second year....	Third year....	Fourth year....	Total.....				
Fort Scott.....	14,000	4,200	2,400	116	72	56	48	292	11	6	4	1
Frankfort.....	1,600	468	401	23	39	24	11	97	4	1	1	2
Franklin (Kiowa).....	1,200	416	341	19	12	7	2	40	3	0	1	2
Fredonia.....	3,000	694	615	24	18	6	10	58	5	2	1	1
Galena.....	8,000	1,869	1,470	74	39	18	15	146	6	3	1	1
Garden City.....	3,500	860	600	37	27	15	14	93	6	3	2	1
Garnett.....	2,500	750	610	45	41	20	25	131	4	4	0	1
Gas.....	1,700	707	520	18	6	3	7	34	2	0	1	1
Girard.....	828	828	612	49	18	14	0	81	3	2	0	1
Glasco.....	900	215	220	15	6	8	3	32	2	2	0	0
Glen Elder.....	600	231	170	10	11	6	10	37	3	1	0	2
Gove County (Gove).....	.....	.....	.....	16	5	5	3	30	3	1	0	0
Gray County (Cimarron).....	600	182	161	25	10	5	4	40	2	0	2	0
Great Bend.....	4,100	1,200	850	66	37	20	18	141	5	4	0	1
Greenleaf.....	954	293	246	15	14	11	4	44	3	4	0	1
Gypsum.....	.....	200	174	11	11	9	4	35	2	0	2	0
Halstead.....	1,100	381	280	65	18	14	6	103	4	3	0	1
Harper.....	1,800	.....	.....	28	9	13	11	61	4	2	2	0
Hartford.....	800	325	275	24	10	7	8	49	2	1	1	1
Harveyville.....	550	192	169	5	10	3	2	20	2	0	0	0
Havensville.....	600	180	169	11	8	6	0	25	1	0	0	1
Hays.....	1,850	540	.....	19	10	5	2	36	2	0	2	0
Herington.....	3,300	910	622	34	18	16	10	78	4	4	0	0
Hiawatha.....	3,500	920	658	27	22	26	21	96	5	5	0	0
Hill City.....	800	395	360	19	10	5	8	42	3	0	3	0
Hillsboro.....	1,000	342	260	7	7	6	0	20	2	2	0	0
Hosington.....	1,900	435	375	18	12	6	7	43	3	2	0	1
Holton.....	924	924	724	43	26	27	37	133	6	6	0	0
Horton.....	4,200	1,157	806	42	25	14	8	89	3	2	1	0
Howard.....	328	328	275	13	11	11	10	59	3	2	1	1
Humboldt.....	2,400	675	492	35	19	11	6	71	4	2	1	1
Hutchinson.....	14,660	3,445	2,650	134	61	45	23	243	10	6	3	1

Iola.....	12,000	3,110	2,614	86	66	47	30	229	5	4	0
Irving.....	400	186	148	18	6	7	3	34	1	1	0
Jewell City.....	1,000	280	266	30	18	9	8	66	0	1	2
Junction City.....	7,800	1,325	1,178	80	50	30	26	186	5	1	2
Kansas City.....	90,000	18,586	11,500	340	293	190	167	990	25	5	10
Kincaid.....	500	165	154	23	10	9	7	49	0	1	1
Kingman.....	3,000	.....	685	30	62	32	21	205	4	0	2
Kinsley.....	1,535	492	430	30	22	18	7	77	3	2	0
LaBette County (Altamont).....	.....	.....	.....	75	27	21	39	162	4	2	0
La Crosse.....	800	.....	192	17	9	5	2	33	2	0	0
La Cygne.....	1,400	350	300	14	14	8	9	50	1	2	2
La Harpe.....	2,500	702	617	36	24	10	9	79	1	0	0
Lansing.....	1,100	319	43	24	10	8	1	43	0	1	1
Larned.....	2,500	663	565	43	28	24	15	110	1	2	0
Lawrence.....	13,000	3,460	2,446	216	148	104	65	539	13	0	6
Leavenworth.....	25,000	7,070	2,650	139	64	53	25	281	8	0	4
Lebo.....	700	205	198	23	9	4	7	43	1	0	0
Lecompton.....	600	200	160	12	8	2	0	22	2	0	0
Leon.....	650	200	160	12	5	4	1	22	2	0	0
Le Roy.....	1,200	252	230	32	10	12	16	70	3	0	0
Lewis Academy (Wichita).....	.....	.....	140	11	16	5	6	38	4	0	1
Liberal.....	2,000	470	400	30	14	4	2	50	2	1	1
Lincoln.....	2,000	497	389	37	25	20	14	96	4	2	0
Lindsborg.....	2,000	150	257	21	12	9	8	50	3	0	1
Linwood.....	350	600	155	13	8	3	3	27	2	0	0
Little River.....	600	235	205	31	8	11	3	53	3	1	0
Logan.....	1,001	.....	240	14	14	5	1	34	2	0	1
Lucas.....	700	190	146	11	2	3	0	16	2	0	1
Lyndon.....	1,200	286	243	32	10	27	9	78	3	1	1
Lyons.....	1,975	561	125	50	32	17	19	118	5	2	1
Mankato.....	1,400	324	354	28	36	24	20	108	4	2	0
Maplehill.....	400	130	121	7	5	0	1	13	2	1	0
Marion.....	2,000	520	420	32	18	4	8	62	4	0	1
Marquette.....	773	317	237	15	10	7	6	39	3	2	0
Marysville.....	2,500	860	450	35	22	18	9	84	4	0	1
McLouth.....	1,000	208	175	23	8	20	5	44	2	1	0
McPherson.....	3,500	1,005	675	39	40	8	11	110	5	1	0
Medicine Lodge.....	1,500	398	362	35	22	10	6	73	4	0	1
Meriden.....	550	.....	175	20	7	3	3	33	2	0	0
Minneapolis.....	1,875	590	422	45	23	10	4	82	4	1	1
Moline.....	1,800	261	209	8	66	60	43	25	2	0	2
Montgomery County (Independence).....	750	.....	125	11	11	4	7	294	11	3	0
Moran.....	.....	.....	.....	24	11	4	4	48	3	0	0
Mound City.....	1,000	.....	.....	24	11	4	7	39	3	0	0

TABLE I.—ENUMERATION AND ENROLMENT—Concluded.

NAME OF SCHOOL.	Population of town.....	School enumeration.....	Total enrolment.....	High-school enrolment.					Number of teachers in high school...	Instructors with college degrees.....	Graduates of normal schools.....	Instructors with no degrees.....
				First year ....	Second year ....	Third year ....	Fourth year ....	Total.....				
Moundridge.....	605	225	182	15	18	7	2	42	2	1	0	1
Neodesha.....	4,500	961	.....	30	21	12	12	75	4	0	3	1
Newton.....	8,000	2,282	1,350	89	33	39	30	190	6	3	0	1
Norton County (Norton).....	.....	.....	.....	80	60	38	22	200	7	4	2	3
Nortonville.....	1,000	225	195	18	12	9	5	49	2	1	1	0
Norwich.....	200	198	158	19	5	5	2	31	2	1	0	1
Oakley.....	1,200	280	240	32	18	16	4	70	3	1	2	0
Olathe.....	5,000	.....	.....	76	58	30	35	199	7	6	0	1
Onaga.....	800	250	230	20	10	8	7	45	3	2	1	0
Osage City.....	3,000	1,072	625	20	18	13	8	59	4	2	1	1
Osawatomie.....	3,996	970	624	36	17	9	22	84	4	2	2	0
Osborne.....	1,700	460	400	33	25	16	13	87	4	4	0	0
Oskaloosa.....	1,100	302	215	24	7	10	6	47	2	2	0	0
Oswego.....	2,500	650	571	33	18	7	8	66	3	2	1	0
Ottawa.....	8,000	2,211	.....	99	55	34	34	222	10	7	1	2
Overbrook.....	575	178	174	16	18	9	6	49	2	2	0	1
Paola.....	3,500	923	690	65	40	35	25	165	6	5	0	1
Parsons.....	6,000	3,124	2,300	100	54	38	27	219	11	5	4	2
Peabody.....	2,500	427	330	29	19	15	14	77	3	2	0	1
Phillipsburg.....	2,000	400	360	18	5	5	4	32	2	1	1	0
Pittsburg.....	17,000	5,000	.....	153	82	55	50	340	10	2	8	0
Plainville.....	1,000	.....	.....	28	5	7	10	50	3	2	1	0
Pleasanton.....	1,531	461	284	28	5	7	10	50	3	2	1	0
Pratt.....	3,000	850	550	44	33	25	18	120	5	4	0	0
Rawlins County (Atwood).....	.....	.....	.....	28	14	9	11	62	3	2	1	0
Reading.....	450	110	109	10	5	4	0	19	2	1	1	0
Redfield.....	560	122	107	14	13	1	0	28	2	1	1	0
Reno County (Nickerson).....	.....	.....	.....	69	74	41	26	210	8	6	1	1
Rosedale.....	6,000	2,100	1,185	35	28	25	9	97	3	2	1	0
Russell.....	1,341	523	404	41	23	17	10	91	3	2	1	0
Sabetha.....	2,200	586	529	46	45	29	34	154	4	3	0	1
Salina.....	9,961	2,210	1,493	115	81	48	35	279	8	5	2	1

Savonburg.....	400	114	100	6	8	0	2	16	2	1	1	0	0
Scott County (Scott).....	649	261	163	21	11	1	8	41	2	1	0	0	0
Scranton.....	1,000	325	225	13	12	1	8	41	2	1	0	0	0
Sedan.....	1,400	527	420	23	14	9	7	53	2	1	1	0	1
Sedgwick.....	2,103	578	208	19	7	10	11	47	3	0	0	0	0
Seneca.....	.....	.....	387	37	25	12	15	89	3	0	0	0	0
Sheridan County (Hoxie).....	.....	.....	.....	25	8	9	6	48	3	1	1	0	0
Sherman County (Goodland).....	.....	.....	.....	20	14	17	10	61	3	2	2	0	0
Smith Center.....	1,500	476	400	48	26	8	13	95	3	1	1	0	0
Solomon.....	1,200	364	328	22	10	11	12	42	2	1	1	0	0
Southern Kansas Academy (Eureka).....	.....	.....	.....	24	12	11	12	59	5	2	2	0	0
Stafford.....	1,700	503	458	44	35	18	7	104	5	1	2	0	0
Sterling.....	2,300	.....	600	59	41	32	24	156	6	4	4	0	0
St. John.....	1,500	401	430	40	38	34	22	134	6	1	3	0	0
St. John's Military (Salina).....	.....	.....	.....	14	7	4	8	28	6	1	4	0	0
St. Marys.....	1,900	526	258	15	5	8	2	30	2	1	1	0	0
St. Marys.....	1,500	300	284	30	17	9	8	64	3	2	1	0	0
Stockton.....	1,800	196	170	18	13	5	0	36	2	1	1	0	0
Summerfield.....	.....	.....	.....	173	60	50	37	320	14	1	2	0	0
Sumner County (Wellington).....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sylvan Grove.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sylvan Grove.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Syracuse.....	1,200	324	220	23	6	4	7	40	3	2	2	0	0
Thomas County (Colby).....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tonganoxie.....	1,000	349	291	33	20	15	6	74	4	0	0	0	0
Topeka.....	43,279	11,424	6,228	371	295	197	175	1,038	38	23	8	7	0
Trego County (Wa Keeney).....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Troy.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Valley Center.....	1,000	.....	263	28	18	9	13	86	4	4	0	0	0
Valley Falls.....	1,500	318	112	15	8	4	1	28	2	2	0	0	0
Vermilion.....	1,200	.....	21	25	6	7	0	59	3	0	3	0	0
Walden Academy (McPherson).....	400	165	119	15	12	10	0	37	2	1	1	0	0
Wamego.....	2,500	490	67	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Washington.....	2,000	496	390	27	21	18	14	80	3	1	2	0	1
Waterville.....	.....	.....	498	40	28	18	15	101	4	3	0	1	1
Wathena.....	.....	.....	212	34	21	13	11	79	3	0	2	2	0
Waverly.....	950	330	252	25	7	11	6	48	2	0	0	0	0
Wellsville.....	600	242	245	32	15	9	5	62	3	1	1	1	0
Westmoreland.....	275	177	200	18	10	9	5	42	2	2	2	0	0
Westmore.....	600	.....	175	11	11	2	8	33	2	1	1	0	0
White City.....	700	198	170	17	9	10	8	54	2	1	1	0	0
White Cloud.....	251	.....	176	11	6	5	2	31	2	0	2	0	0
Wichita.....	40,660	9,400	327	189	125	79	4	720	22	19	1	2	2
Williamsburg.....	600	.....	160	9	4	3	0	20	2	0	1	0	0
Wilson.....	1,000	325	254	21	11	12	0	44	2	1	1	0	0
Winfield.....	8,000	1,943	102	57	88	81	18	228	8	6	2	1	0
Yates Center.....	2,500	680	550	40	33	28	18	119	5	4	1	0	0

TABLE I.

A study of table I reveals a few facts that may be worth while, especially in so far as we are able to compare with results of previous years. The total enrolment of high-school students by years is as follows:

	<i>First year.</i>	<i>Second year.</i>	<i>Third year.</i>	<i>Fourth year.</i>	<i>Total.</i>
1908-'09 .....	9,133	5,869	3,980	3,026	22,008
1907-'08 .....	8,355	5,307	3,620	2,555	19,837

The fourth year shows an increase of 471, or 18.1 per cent., while the total enrolment has increased but 10 per cent. What is of equal importance, however, is the fact that 16 per cent. of last year's Junior class are not enrolled this year with the Seniors, and that 28 per cent. of last year's Freshman class are not enrolled in the present second-year class. A few schools failed to furnish names of the Senior class, hence it is impossible to give the exact ratio of boys and girls. Of the 2870 Seniors reported 1741 are girls and 1129 are boys. Assuming that the 156 not reported are special students, which is not far from correct, the number of girls has increased 10.5 per cent., while the number of boys has increased 15 per cent. over last year.

The total number of high-school teachers, including special teachers, and superintendents who instruct one or more hours in the high school, is 993. Of this number 418, or 42.1 per cent., are men, and 575, or 57.9 per cent., are women. The records of 1907-'08 show that 33½ per cent. of the total number of high-school teachers were men.

Of the total number giving instruction in high schools, 615, or about 62 per cent., are graduates of colleges, 251 are graduates of normal schools, and 127 are reported as not having completed any special course of study. Ten per cent. of this number are graduates of high schools only.

The following table, representing fourteen cities having a population of 3000 to 8000, will indicate the relation existing between the high-school enrolment and the enumeration and total enrolment. It shows that the cities vary considerably in reference to the per cent. of the total enrolment found in the high school, and also the per cent. of the enumeration which is not enrolled in the schools. It is unnecessary to point out any particular place; the figures will show for themselves.

NAME OF SCHOOL.	Enumeration.....	Total enrolment.....	High-school enrol- ment.....	Per cent. of enumera- tion out of school...	Per cent. of total en- rolment in high school.....
Abilene.....	1,274	1,090	192	15	17.6
Arkansas City.....	1,944	1,355	176	30.3	13
Chanute.....	2,581	1,847	224	28.4	12.1
Cherryvale.....	1,390	1,100	114	21.1	10
Concordia.....	1,190	741	131	37.8	17.6
Council Grove.....	688	512	107	25.1	21
El Dorado.....	962	820	169	15	20.5
Fredonia.....	694	615	59	11.4	9.6
Garden City.....	860	600	93	20.3	15.5
Great Bend.....	1,200	850	148	29.2	17.4
Hiawatha.....	920	658	96	28.5	14.6
Newton.....	2,282	1,350	191	40.9	14.1
Osawatomie.....	970	624	84	35.7	13.4
Paola.....	923	690	165	25.3	24

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### TABLE II.—SALARIES, ETC.

NAME OF SCHOOL.	Salary of superintendent.....	Salary of principal.....	Average salary of assistants..	Average salary of grade teachers .....	Number of pupils in grades.....	Number of teachers in grades.....	Average number of pupils per teacher in high school...	Maximum number of classes per teacher...	Number of weeks in school year...
Abilene.....	\$1,400	\$900	\$70 00	\$47 00	898	17	27	6	36
Alden.....	900	540	60 00	50 00	103	3	16	6	36
Alma.....	1,200	1,200	70 00	52 25	160	4	21	5	36
Almena.....	765	900	60 00	50 00	211	2	105	6	36
Alta Vista.....	855	675	60 00	57 00	127	2	17	4	36
Altoona.....	1,100	585	60 00	51 78	390	7	54	7	36
Anthony.....	1,100	720	62 60	50 00	566	13	24	6	36
Argentine.....	1,620	720	65 00	49 64	950	24	25	6	36
Arkansas City.....	1,400	900	70 00	54 14	1,179	29	24	6	36
Atchison County (Effingham)	1,600	1,300	85 00	53 51	1,734	37	18	6	36
Atchison.....	1,125	1,125	75 00	50 00	173	3	24	6	36
Attica.....	1,125	1,080	80 00	40 00	276	7	19	6	36
Augusta.....	1,100	540	60 00	40 00	178	4	21	6	36
Axtell.....	675	675	60 00	50 00	84	4	20	6	36
Barnard.....	675	525	58 00	49 16	100	3	12	8	36
Basehor.....	765	400	50 00	45 00	156	2	10	6	36
Beatlie.....	855	540	60 00	43 75	450	4	27	6	36
Belleville.....	1,000	675	60 00	48 00	450	10	28	6	36
Belle Plaine.....	837	675	75 00	52 00	156	4	22	7	36
Beloit.....	1,200	810	70 00	45 00	475	12	39	7	36
Blue Mound.....	800	480	60 00	51 25	111	4	25	7	32
Blue Rapids.....	1,300	720	70 00	50 00	313	8	14	6	36
Bonner Springs.....	999	540	60 00	50 00	288	7	13	6	36
Bronson.....	675	675	50 00	40 00	96	3	15	6	36
Brookville.....	1,000	585	65 00	50 00	322	3	19	6	36
Bunkerhill.....	720	540	60 00	50 00	90	2	18	6	36
Burden.....	1,000	540	60 00	43 75	154	2	7	4	36
Burlington.....	1,100	675	66 00	50 00	377	4	12	5	36
Burlingame.....	1,055	585	56 67	45 80	358	10	37	6	36
Burr Oak.....	855	495	55 00	48 75	200	9	22	6	36
Burton.....	820	585	55 00	40 75	133	4	20	9	32
Caldwell.....	1,050	600	60 00	52 50	518	10	15	6	36

Caney.....	1,350	810	65 00	53 62	327	23	35	16	6	36
Canton.....	810	810	60 00	50 00	116	4	29	15	7	36
Carbondale.....	900	585	65 00	40 00	146	4	36	19	8	36
Cawker City.....	945	675	75 00	.....	155	4	39	22	7	36
Cedar Vale.....	720	480	60 00	47 00	298	8	37	16	7	32
Centralia.....	900	450	52 50	45 00	156	4	39	18	7	36
Chanute.....	1,350	855	64 00	54 00	1,623	35	46	28	6	36
Chase County (Cottonwood Falls).....	.....	1,300	83 00	.....	.....	.....	.....	19	6	36
Chelsea (Kansas City, Kan.).....	.....	1,500	72 00	56 00	508	11	46	22	6	36
Cheney.....	900	630	70 00	60 00	162	4	40	16	6	36
Cherokee County (Columbus).....	.....	1,500	80 00	.....	.....	.....	.....	23	7	36
Cherryvale.....	1,200	850	80 00	55 00	986	23	42	23	5	36
Clay County (Clay Center).....	.....	1,400	75 00	.....	.....	.....	.....	29	7	36
Clearwater.....	900	675	65 00	55 00	108	3	36	14	7	36
Clifton.....	765	585	65 00	.....	149	4	37	20	7	36
Clyde.....	1,080	495	55 00	45 00	250	6	41	14	7	36
Coffeyville.....	1,800	1,000	78 30	.....	2,350	58	40	22	8	36
Colony.....	900	540	67 00	50 00	125	4	31	33	7	32
Concordia.....	1,600	1,000	76 67	51 67	610	13	47	26	7	36
Coolidge.....	720	450	50 00	50 00	57	2	28	6	5	36
Council Grove.....	1,150	630	57 50	50 00	405	11	36	26	6	36
Crawford County (Cherokee).....	.....	1,320	78 00	.....	.....	.....	.....	19	6	36
Decatur County (Oberlin).....	.....	1,200	81 00	44 00	267	6	44	22	6	36
Delphos.....	810	450	50 00	52 00	147	4	36	15	7	86
Derby.....	630	500	.....	55 00	108	2	54	8	5	36
Dickinson County (Chapman).....	.....	1,300	90 00	.....	.....	.....	.....	24	6	36
Dixon Township (Argonia).....	.....	720	60 00	50 00	110	4	27	17	8	36
Dodge City.....	1,500	1,000	75 00	56 00	623	13	47	28	6	36
Douglas.....	900	675	60 00	.....	251	5	50	21	7	36
Downs.....	900	675	60 00	52 00	356	8	44	20	6	36
Edwardsville.....	.....	990	65 00	50 00	98	3	32	13	8	35
El Dorado.....	1,375	765	69 00	55 00	651	14	45	21	8	36
Ellinwood.....	765	540	60 00	51 25	175	4	43	13	8	36
Ellis.....	1,200	720	60 00	65 00	233	5	46	13	7	36
Ellsworth.....	1,200	810	70 00	55 00	370	9	41	23	7	36
Elwood.....	.....	900	60 00	45 00	199	6	33	7	7	36
Emporia.....	1,600	1,100	87 50	58 79	1,631	38	42	28	.....	36
Enterprise.....	.....	810	52 50	46 00	227	6	38	18	8	36
Enterprise Academy.....	.....	.....	.....	.....	.....	.....	.....	12	8	36
Erie.....	1,125	540	60 00	50 00	100	6	51	20	8	36
Esksridge.....	1,000	675	70 00	57 50	134	4	33	21	7	36
Eudora.....	765	495	55 00	50 00	170	4	42	20	6	36
Eureka.....	1,100	675	56 00	44 00	446	11	.....	18	.....	36
Florence.....	900	585	40 00	48 00	270	8	33	16	6	35

TABLE II.—SALARIES, ETC.—Continued.

NAME OF SCHOOL.	Salary of super- intendent.....	Salary of prin- cipal.....	Average salary of assistants..	Average salary of grade teachers.....	Number of pupils in grades.....	Number of teachers in grades.....	Average num- ber of pupils per teacher in grades.....	Average num- ber of pupils per teacher in high school...	Maximum num- ber of classes per teacher...	Number of weeks in school year...
Fort Scott.....	\$2,000	\$1,500	\$62 00	\$50 00	2,108	7	43	26	6	36
Frankfort.....	1,300	675	60 00	50 00	304	7	43	24	6	36
Franklin High School (Kiowa).....	1,125	585	60 00	50 00	301	11	50	13	6	36
Fredonia.....	1,000	810	62 00	50 00	557	28	46	14	8	36
Galena.....	1,500	810	69 00	49 00	1,300	13	39	29	6	36
Garden City.....	1,200	765	70 00	54 61	507	10	47	15	7	36
Garnett.....	1,000	675	60 00	51 50	479	14	34	32	7	36
Gas.....	1,000	680	67 50	47 50	476	12	44	17	7	36
Girard.....	1,100	540	45 00	42 00	531	4	44	27	5	36
Glasc.....	675	280	35 00	52 50	178	4	44	16	7	36
Glen Elder.....	900	540	55 00	49 00	133	4	33	12	.....	36
Gove County (Gove).....	.....	1,220	70 00	.....	.....	.....	.....	10	6	36
Gray County (Cimarron).....	.....	1,000	65 00	59 00	121	3	40	20	6	36
Great Bend.....	1,500	900	70 00	52 50	702	14	50	28	6	36
Greenleaf.....	900	450	50 00	40 00	202	4	50	14	6	36
Gypsum.....	900	540	60 00	50 00	139	4	34	17	6	36
Halstead.....	1,125	765	65 00	52 50	177	4	44	25	6	36
Harper.....	1,125	585	50 00	50 00	.....	8	45	15	6	36
Hartford.....	.....	900	55 00	46 00	226	5	45	24	7	36
Harveyville.....	720	540	60 00	50 00	149	3	49	7	6	32
Havensville.....	792	.....	.....	55 00	144	4	36	25	8	35
Hays.....	1,080	607	67 50	53 12	.....	5	.....	18	7	36
Herington.....	1,250	675	65 00	49 00	544	13	41	19	5	36
Hiawatha.....	1,200	765	62 50	46 00	562	16	35	19	6	36
Hill City.....	.....	810	55 00	49 00	318	5	63	14	7	36
Hillsboro.....	800	480	60 00	47 00	240	6	40	10	6	32
Holisington.....	1,000	675	55 00	54 25	332	9	37	14	6	36
Holton.....	1,320	810	65 00	50 00	591	14	41	22	6	36
Horton.....	1,200	560	50 00	43 44	717	16	44	29	6	32
Howard.....	1,150	675	65 00	49 00	216	6	36	19	7	36
Humboldt.....	1,000	810	80 00	52 00	421	9	46	18	6	36
Hutchinson.....	1,800	1,100	79 00	53 00	2,387	50	47	26	6	36

Iola.....	1,800	1,200	78 00	55 00	2,385	46	51	25	5	36
Irving.....	765	540	.....	50 00	114	3	38	17	7	36
Jewell City.....	990	520	70 00	52 00	200	4	50	22	7	36
Junction City.....	1,800	960	77 50	51 87	992	22	45	23	5	36
Kansas City.....	2,700	1,800	95 00	67 79	10,519	215	48	24	6	36
Kincaid.....	900	630	70 00	47 50	105	3	35	24	7	36
Kingsman.....	1,200	765	75 00	50 00	480	11	43	34	6	36
Kinsley.....	1,200	698	72 00	52 00	353	8	44	26	6	36
Labette County (Altamont).....	.....	1,100	75 00	.....	.....	.....	.....	20	6	38
La Crosse.....	855	450	.....	.....	159	4	39	16	8	32
La Cygne.....	900	585	58 75	44 17	250	6	41	16	6	36
La Harpe.....	1,000	720	65 00	50 00	532	13	40	15	7	36
Lansing.....	.....	855	55 00	57 50	197	4	49	21	6	36
Larned.....	1,100	810	65 00	50 00	455	10	45	36	8	36
Lawrence.....	2,000	1,600	67 50	48 40	1,887	42	44	28	6	36
Leavenworth.....	2,400	1,350	102 00	59 50	2,369	60	39	23	6	36
Lebo.....	810	630	70 00	47 50	145	4	35	21	7	36
Lecompton.....	720	495	55 00	45 00	106	3	35	11	7	36
Leon.....	900	675	.....	47 50	138	4	34	11	7	34
Le Roy.....	900	585	55 00	52 00	160	4	40	23	6	36
Lewis Academy (Wichita).....	.....	1,500	70 00	55 00	102	2	50	7	6	37
Liberal.....	900	540	60 00	50 00	350	7	50	25	6	36
Lincoln.....	1,000	675	67 00	48 50	298	10	29	24	6	36
Lindsborg.....	900	495	55 00	50 00	207	7	29	17	6	36
Linwood.....	.....	720	50 00	50 00	129	4	32	13	6	36
Little River.....	945 50	675	65 00	52 00	152	4	38	17	6	36
Logan.....	1,000	.....	55 00	50 00	206	4	51	17	7	36
Lucas.....	700	450	50 00	50 00	130	3	43	8	8	36
Lyndon.....	900	540	45 00	45 00	165	4	41	26	7	36
Lyons.....	1,250	810	71 00	50 00	482	10	48	23	7	36
Mankato.....	1,100	675	62 00	50 00	246	5	49	27	6	36
Maplehill.....	900	600	63 00	52 00	108	2	54	6	4	32
Marion.....	1,200	675	70 00	53 00	359	8	44	15	6	36
Marquette.....	.....	810	62 00	50 00	198	4	49	13	6	36
Marysville.....	1,350	810	65 00	50 00	366	10	35	21	6	36
McLouth.....	900	540	.....	41 87	131	4	32	22	6	36
McPherson.....	1,200	855	63 00	50 00	565	14	40	22	5	36
Medicine Lodge.....	1,200	540	54 00	47 00	289	7	41	18	6	36
Meriden.....	630	.....	55 00	50 00	142	4	35	16	6	36
Minneapolis.....	1,200	720	70 00	51 00	340	10	34	20	6	36
Moline.....	810	630	.....	45 00	184	4	46	12	8	36
Montgomery County (Independence).....	.....	2,000	100 00	.....	.....	.....	.....	26	5	36
Moran.....	900	540	50 00	45 00	207	4	51	14	7	36
Mound City.....	800	440	55 00	54 00	136	4	34	19	7	32

TABLE II.—SALARIES, ETC.—*Concluded.*

NAME OF SCHOOL.	Salary of super- intendent.....	Salary of prin- cipal.....	Average salary of assistants..	Average salary of grade teachers .....	Number of pupils in grades .....	Number of teachers in grades .....	Average num- ber of pupils per teacher in grades.....	Average num- ber of pupils per teacher in high school....	Maximum num- ber of classes per teacher....	Number of weeks in school year....
Moundridge.....	\$765	\$600	\$75 00	\$47 00	140	4	35	21	7	32
Neodesha.....	1,200	675	70 00	50 00	.....	18	.....	18	6	36
Newton.....	1,500	1,000	70 00	58 00	1,159	26	44	31	6	36
Norton County (Norton).....	.....	1,320	77 00	.....	.....	.....	.....	28	7	36
Nortonville.....	1,000	540	60 00	42 00	146	4	36	24	7	36
Norwich.....	900	540	60 00	50 00	117	4	29	15	7	36
Oakley.....	900	630	70 00	53 00	170	4	42	25	6	36
Olathe.....	1,400	700	65 00	45 00	631	22	28	28	6	36
Onaga.....	900	585	60 00	54 00	185	4	46	15	6	36
Osage City.....	1,000	810	65 00	42 00	576	14	41	14	6	36
Osawatimie.....	1,000	720	58 00	44 00	540	13	41	21	5	36
Osborne.....	990	630	70 00	48 00	313	8	39	21	6	36
Oskaloosa.....	1,000	585	55 00	45 00	168	5	33	23	7	36
Oswego.....	800	480	50 00	40 00	505	10	50	22	7	32
Ottawa.....	1,500	900	70 00	.....	1,288	.....	.....	22	6	36
Overbrook.....	600	400	.....	45 00	125	3	41	24	7	32
Paola.....	1,100	1,000	72 00	50 00	525	15	35	27	6	36
Parsons.....	1,500	900	75 00	53 00	2,081	38	54	19	6	36
Peabody.....	1,300	675	65 00	50 00	253	8	31	25	7	36
Phillipsburg.....	1,000	630	.....	52 00	328	8	41	16	8	36
Pittsburg.....	2,000	1,400	68 00	50 00	3,052	50	61	34	7	36
Plainville.....	700	585	55 00	50 00	214	6	35	16	6	36
Pleasanton.....	950	450	50 00	50 00	305	6	50	35	7	36
Pratt.....	.....	1,200	89 00	52 00	430	11	39	24	5	36
Rawlins County (Atwood).....	.....	1,080	80 00	.....	.....	.....	.....	20	7	36
Reading.....	675	480	60 00	60 00	90	3	30	9	7	32
Redfield.....	675	456	57 00	45 00	79	2	39	14	7	32
Reno County (Nickerson).....	.....	1,500	91 00	.....	.....	.....	.....	26	6	40
Rosedale.....	1,400	810	65 00	50 00	1,088	24	45	32	7	36
Russell.....	1,000	630	65 00	50 00	313	8	39	30	7	36
Sabetha.....	1,100	900	62 00	47 00	375	9	41	38	6	36
Salina.....	1,800	1,350	86 00	57 00	1,214	32	37	34	6	36

Savonburg.....	720	55 00	47 00	84	2	42	8	36
Scott County (Scott).....	720	75 00	60 00	163	4	40	20	32
Scranton.....	675	50 00	35 00	184	4	46	20	36
Sedan.....	900	65 00	35 00	347	9	38	26	36
Sedgwick.....	855	540	61 00	161	5	32	15	36
Seneca.....	1,200	630	46 00	298	9	33	29	36
Sheridan County (Hoxie).....	1,200	82 00					16	36
Sherman County (Goodland).....	1,200	75 00					20	36
Smith Center.....	1,000	55 00	50 00	305	9	33	31	36
Solomon.....	900	630	46 00	286	7	40	21	36
Southern Kansas Academy (Eureka).....	1,000	60 00					11	36
Stafford.....	1,100	70 00	54 00	354	8	44	20	36
Sterling.....	1,300	80 00	57 00	444	10	44	26	36
St. John.....	1,200	70 00	55 00	296	7	42	22	36
St. John's Military (Salina).....							4	34
St. Marys.....	900	540	51 00	229	6	38	15	36
Stockton.....	800	540	45 00	220	8	27	21	36
Summerfield.....	810	50 00	46 00	134	4	33	22	36
Summer County (Wellington).....	1,600	94 00					18	36
Sylvan Grove.....	720	50 00	50 00	79	3	26	16	36
Syracuse.....	1,125	55 00	50 00	180	8	22	13	36
Thomas County (Colby).....	1,100	81 00	44 00				20	36
Tonganoxie.....	1,000	60 00	50 00	217	5	43	18	36
Topeka.....	2,500	1,900	66 00	5,183	171	30	27	36
Trego County (Wa Keeney).....	1,400	76 00					21	36
Troy.....	1,000	65 00	45 00	195	6	92	22	36
Valley Center.....	765	585	51 00	84	3	28	14	36
Valley Falls.....	900	630	57 00	178	6	29	19	36
Vermilion.....	765	540	40 00	83	3	27	18	36
Walden Academy (McPherson).....		720	70 00	50			4	36
Wamego.....	1,045	675	47 00	310	8	38	26	36
Washington.....	1,080	765	48 00	397	8	49	25	36
Waterville.....	1,000	675	45 00	133	5	25	25	36
Wathena.....	1,000	675	45 00	204	5	40	24	36
Waverly.....	900	540	49 00	183	4	46	20	36
Wellsville.....	720	540	60 00	158	5	31	21	36
Westmoreland.....	765	495	55 00	142	4	35	16	36
Wetmore.....	900	640	50 00	121	4	30	27	36
White City.....		700	52 00	139	4	34	15	36
White Cloud.....	900	66 67	50 00	152	3	50	12	36
White Cloud.....	2,500	1,800	41 00				31	36
Wichita.....	700	360	65 00	140	4	35	10	36
Williamsburg.....	900	75 00	45 00	210	4	52	22	36
Wilson.....	1,800	675	70 00	1,117	29	38	28	36
Winfield.....	1,200	1,900	46 00				6	36
Yates Center.....		65 00	55 00	432	11	39	23	36

**TABLE II.**

As referred to elsewhere in this bulletin, eagerness upon the part of school authorities to build up a high school, sometimes at the expense of the grades, is apparent when one examines the figures in table II. Twenty-eight schools are employing three teachers or less in the grades. This often increases the number of pupils per teacher far beyond the average for the state. A few of the schools in this class average above 60 pupils per teacher, while in one school the number reaches 75. These facts would indicate that the grade work is being slighted in order that it may be possible to employ a second assistant in the high school. Under no consideration should the needs of the lower grades be sacrificed in order to add a year's work to the high school. Such an arrangement weakens the efficiency of the elementary school and furnishes a poor foundation for high-school work.

It is also worthy of notice that 208 schools affiliated with the University continue for a term of thirty-six weeks, while twenty-one schools shorten the term from two to four weeks. In this respect the showing made is much better than it was two years ago. I have not taken the trouble to find any averages in reference to the salaries with the exception of noting that the average salary for assistants in the high schools for the present year is \$64.27 per month, and to note further that there has been a very noticeable increase in salaries for the past two years. The lowest salary paid any high-school teacher is \$40, which only occurs in one or two instances; very few teachers are employed at less than \$60 per month.

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TABLE III. — EQUIPMENT.

NAME OF SCHOOL.	Reference books, volumes.....	General reading.....	Maps and charts .....	Number of volumes added last year.....	Physics, value..	Chemistry, value .....	Botany, value...	Zoology, value..
Abilene.....	280	800	12	25	\$300 00	\$200 00	\$75 00	.....
Alden.....	60	90	20	5	.....	.....	.....	.....
Alma.....	60	150	1	0	200 00	.....	300 00	.....
Almena.....	.....	400	4	2	30 00	.....	.....	.....
Alta Vista.....	25	0	0	0	.....	.....	125 00	.....
Altoona.....	80	50	4	16	120 00	.....	50 00	.....
Anthony.....	1,216	250	1	16	400 00	.....	80 00	.....
Argentina.....	.....	.....	10	20	200 00	100 00	100 00	.....
Arkansas City.....	500	400	7	.....	235 00	250 00	10 00	.....
Atchison County (Effingham).....	250	2,400	15	50	250 00	125 00	100 00	.....
Atchison.....	375	.....	25	0	300 00	.....	100 00	.....
Atica.....	100	400	2	0	125 00	.....	.....	.....
Augusta.....	50	50	1	0	200 00	.....	25 00	\$25 00
Axtell.....	200	400	4	100	175 00	.....	75 00	.....
Barnard.....	12	40	5	0	95 00	.....	.....	.....
Basehor.....	40	200	10	100	70 00	.....	40 00	.....
Beattie.....	25	275	0	40	26 00	.....	45 00	.....
Belleville.....	125	275	5	15	200 00	.....	50 00	.....
Belle Plaine.....	55	200	3	30	75 00	.....	15 00	.....
Beloit.....	600	2,000	10	250	400 00	.....	300 00	.....
Beloit.....	150	.....	1	0	160 00	.....	10 00	.....
Blue Mound.....	100	25	34	40	300 00	.....	100 00	.....
Blue Rapids.....	.....	.....	1	.....	200 00	35 00	15 00	.....
Bonner Springs.....	.....	.....	1	.....	125 00	.....	.....	.....
Bronson.....	100	325	0	0	250 00	20 00	10 00	.....
Brookville.....	300	600	11	25	.....	.....	.....	.....
Bunkerhill.....	30	180	0	80	.....	.....	.....	.....
Burden.....	90	210	7	40	143 71	.....	44 85	.....
Burlington.....	150	125	91	40	250 00	70 00	45 00	.....
Burlingame.....	500	2,000	15	150	250 00	.....	25 00	25 00
Burr Oak.....	100	210	2	10	25 00	.....	.....	.....
Burton.....	80	600	0	100	90 00	50 00	100 00	.....
Caldwell.....	250	500	14	100	300 00	.....	50 00	.....

TABLE III.—EQUIPMENT—Continued.

NAME OF SCHOOL.	Reference books, volumes.....	General reading.....	Maps and charts .....	Number of volumes added last year.....	Physics, value..	Chemistry, value .....	Botany, value...	Zoology, value..
Caney.....	75	75	0	50	\$200 00	.....	\$40 00	.....
Canton.....	75	200	3	0	50 00	.....	.....	.....
Carbondale.....	50	50	20	0	100 00	\$50 00	25 00	.....
Cawker City.....	33	144	104	0	.....	.....	.....	.....
Cedar Vale.....	135	575	13	25	100 00	.....	65 00	.....
Centralia.....	45	200	32	0	75 00	.....	35 00	.....
Chanute.....	100	200	10	40	200 00	200 00	50 00	.....
Chase County (Cottonwood Falls).....	400	100	10	300	300 00	100 00	100 00	.....
Chelsea (Kansas City, Kan.).....	120	1,380	0	300	320 00	280 00	100 00	\$100 00
Cheney.....	185	167	13	260	198 00	292 00	40 00	.....
Cherokee County, (Columbus).....	905	100	0	90	530 00	250 00	200 00	.....
Cherryvale.....	300	300	10	300	50 00	.....	30 00	.....
Clay County, (Clay Center).....	200	700	8	87	200 00	150 00	100 00	.....
Clearwater.....	150	25	7	20	.....	.....	50 00	40 00
Clifton.....	50	250	0	0	125 00	.....	.....	.....
Clyde.....	200	800	10	100	150 00	.....	75 00	.....
Coffeyville.....	200	1,800	5	0	200 00	250 00	100 00	.....
Colony.....	60	400	3	48	50 00	150 00	.....	.....
Concordia.....	300	400	5	100	530 00	.....	200 00	.....
Coolidge.....	0	0	0	0	.....	.....	.....	.....
Council Grove.....	75	425	0	15	225 00	.....	50 00	.....
Crawford County (Cherokee).....	150	100	7	50	250 00	.....	50 00	.....
Decatur County (Oberlin).....	150	326	5	0	275 00	.....	.....	.....
Delphos.....	50	210	12	10	250 00	.....	35 00	.....
Derby.....	30	120	21	10	.....	.....	.....	.....
Dickinson County (Chapman).....	500	3,500	22	0	200 00	150 00	100 00	.....
Dixon Township (Argonia).....	150	280	28	80	250 00	.....	50 00	.....
Dodge City.....	125	50	8	50	350 00	.....	75 00	.....
Douglas.....	50	100	0	40	75 00	.....	40 00	.....
Downs.....	60	100	5	10	200 00	.....	60 00	.....
Edwardsville.....	50	500	6	0	75 00	.....	25 00	.....
El Dorado.....	500	500	0	6	200 00	.....	75 00	25 00

Location	1883	6	32	125 00	75 00	75 00
Ellinwood.....	78	183	6	32	125 00	75 00
Ellis.....	106	250	0	50	0	75 00
Ellsworth.....	400	275	14	400	150 00	15 00
Elwood.....	160	192	5	342	132 33	250 00
Emporia.....	200	600	8	30	100 00	50 00
Enterprise.....	100	550	18	40	150 00	50 00
Enterprise Academy.....	100	1,250	0	150	50 00	50 00
Erie.....	50	200	0	50	100 00	35 00
Esbridge.....	200	400	6	500	150 00	30 00
Eudora.....	200	300	0	60	65 00	22 00
Eureka.....	100	600	0	0	75 00	75 00
Florence.....	0	15	0	15	300 00	100 00
Fort Scott.....	350	2,000	5	368	1,000 00	100 00
Frankfort.....	30	455	150	75	200 00	75 00
Franklin High School (Klawa).....	120	515	5	75	200 00	100 00
Fredonia.....	45	25	0	20	175 00	250 00
Galena.....	150	400	110	50	200 00	250 00
Garden City.....	350	100	8	64	150 00	200 00
Garnett.....	175	250	5	40	150 00	25 00
Gas.....	300	120	3	150	250 00	15 00
Girard.....	120	211	12	0	150 00	40 00
Glascow.....	50	125	10	0	0	15 00
Glen Elder.....	75	450	11	20	130 00	10 00
Gove County (Gove).....	400	200	1	100	150 00	150 00
Gray County (Cimarron).....	30	70	0	0	0	50 00
Great Bend.....	150	0	2	0	300 00	50 00
Greenleaf.....	120	200	116	15	100 00	50 00
Gypsum.....	25	175	0	35	225 00	100 00
Halstead.....	250	350	223	75	75 00	75 00
Harper.....	0	0	0	0	0	50 00
Hartford.....	16	168	119	65	0	40 00
Harveyville.....	10	190	0	0	115 00	40 00
Havensville.....	300	150	150	15	0	75 00
Hays.....	150	125	8	40	200 00	50 00
Herington.....	143	140	111	10	150 00	30 00
Hiawatha.....	440	0	18	15	605 00	185 00
Hill City.....	60	150	7	15	60 00	20 00
Hillsboro.....	75	150	1	6	0	185 00
Holingsboro.....	135	0	10	0	150 00	50 00
Holton.....	200	600	80	12	200 00	200 00
Horton.....	200	1,000	4	110	75 00	75 00
Howard.....	250	600	7	25	150 00	40 00
Humboldt.....	675	300	10	150	200 00	90 00
Hutchinson.....						

TABLE III.—EQUIPMENT—Continued.

NAME OF SCHOOL.	Reference books, volumes.....	General reading.....	Maps and charts .....	Number of volumes added last year.....	Physics, value..	Chemistry, value.....	Botany, value...	Zoology, value..
Iola.....	1,000	0	6	50	\$300 00	\$200 00	\$200 00	.....
Irving.....	30	130	0	20	143 00	.....	30 00	\$12 00
Jewell City.....	600	600	0	50	100 00	.....	30 00	.....
Junction City.....	750	265	8	68	215 00	.....	175 00	.....
Kansas City.....	1,250	.....	15	.....	1,500 00	1,350 00	1,000 00	.....
Kincaid.....	100	100	6	48	150 00	.....	120 00	100 00
Kingman.....	400	0	5	150	250 00	.....	125 00	.....
Kinsley.....	75	1,075	12	75	175 00	75 00	85 00	40 00
Labette County (Altamont).....	400	300	12	150	250 00	.....	100 00	.....
La Crosse.....	150	50	0	25	75 00	.....	50 00	.....
La Cygne.....	115	400	3	47	100 00	.....	50 00	.....
La Harpe.....	200	400	0	200	150 00	.....	50 00	.....
Lansing.....	200	150	4	25	250 00	.....	50 00	50 00
Larned.....	0	0	1	0	125 00	.....	50 00	.....
Lawrence.....	.....	1,200	0	0	925 00	425 00	150 00	.....
Leavenworth.....	1,000	2,600	20	200	1,864 40	1,300 00	150 00	395 00
Lebo.....	75	25	10	25	.....	.....	50 00	.....
Lecompton.....	150	150	8	10	150 00	.....	100 00	.....
Leon.....	300	200	12	75	60 00	.....	35 00	.....
Le Roy.....	40	200	12	35	200 00	.....	30 00	.....
Lewis Academy (Wichita).....	1,000	.....	15	0	350 00	350 00	150 00	.....
Liberal.....	20	40	0	0	.....	.....	.....	.....
Lincoln.....	150	250	1	30	150 00	100 00	35 00	.....
Lindsborg.....	195	214	1	80	200 00	.....	75 00	.....
Linwood.....	.....	300	0	0	112 00	.....	40 00	.....
Little River.....	65	135	10	25	175 00	.....	75 00	.....
Logan.....	10	50	0	0	.....	.....	.....	.....
Lucas.....	50	200	2	7	.....	75 00	18 00	.....
Lyndon.....	200	200	0	0	200 00	.....	100 00	.....
Lyons.....	200	400	2	50	200 00	.....	50 00	.....
Mankato.....	300	.....	16	25	225 00	125 00	75 00	.....
Maplehill.....	40	30	0	15	.....	.....	35 00	.....

Marion.....	300	500	4	50	.....	.....	125 00	.....
Marquette.....	45	300	225	10	.....	.....	.....	.....
Marysville.....	150	1,000	15	50	200 00	.....	50 00	.....
McLouth.....	0	0	0	0	.....	.....	.....	.....
McPherson.....	57	360	2	0	150 00	.....	.....	.....
Medicine Lodge.....	300	1,500	12	120	200 00	10 00	.....	.....
Meriden.....	45	180	5	60	.....	.....	40 00	.....
Minneapolis.....	200	1,000	45	60	150 00	.....	50 00	50 00
Moline.....	52	510	0	0	250 00	.....	75 00	125 00
Montgomery County (Independence).....	500	1,500	17	100	800 00	700 00	100 00	100 00
Moran.....	25	200	2	25	75 00	10 00	20 00	.....
Mound City.....	200	100	0	25	100 00	.....	75 00	.....
Moundridge.....	94	374	0	0	75 00	.....	30 00	.....
Neodesha.....	75	150	7	.....	.....	.....	30 00	.....
Newton.....	500	.....	6	0	250 00	150 00	75 00	.....
Norton County (Norton).....	1,100	500	8	50	240 00	150 00	155 00	.....
Nortonville.....	800	1,200	5 series	150	150 00	150 00	.....	.....
Norwich.....	50	170	0	0	125 00	.....	60 00	50 00
Oakley.....	24	275	1	25	250 00	.....	50 00	50 00
Olathe.....	50	300	15	150	150 00	.....	25 00	.....
Onaga.....	50	200	4	25	100 00	75 00	50 00	.....
Osage City.....	150	750	2	.....	250 00	62 50	75 00	.....
Osawatimie.....	20	150	11	12	192 50	.....	54 00	.....
Osborne.....	40	300	12	0	240 00	.....	.....	.....
Oskaloosa.....	.....	60	175	200	90 00	.....	.....	.....
Oswego.....	250	350	5	0	100 00	150 00	50 00	50 00
Ottawa.....	300	.....	7	0	150 00	200 00	35 00	.....
Overbrook.....	26	20	0	4	100 00	600 00	200 00	.....
Paola.....	75	200	0	0	300 00	500 00	100 00	50 00
Parsons.....	600	200	0	200	150 00	.....	60 00	.....
Peabody.....	25	75	9	50	125 00	.....	.....	.....
Phillipsburg.....	30	120	22	.....	.....	400 00	300 00	.....
Pittsburg.....	400	300	0	30	300 00	.....	40 00	.....
Plainville.....	100	200	3	50	100 00	.....	75 00	.....
Pleasanton.....	130	120	9	10	130 00	.....	75 00	75 00
Pratt.....	400	100	152	100	100 00	.....	.....	.....
Rawlins County (Atwood).....	118	132	3	20	165 00	.....	.....	.....
Reading.....	130	295	14	0	50 00	.....	.....	.....
Reddie d.....	.....	.....	6 sets	310	1,000 00	150 00	250 00	250 00
Reno County (Nickerson).....	317	141	1	100	250 00	.....	30 00	.....
Rosedale.....	275	50	4	25	200 00	.....	45 00	.....
Russell.....	270	850	14	30	250 00	.....	.....	.....
Sabetha.....	100	.....	4	0	.....	.....	.....	.....
Salina.....	.....	.....	.....	.....	.....	.....	.....	.....



Waterville.....	100	150	0	0	85 00	.....	.....	.....
Wathena.....	130	125	1	12	150 00	.....	.....	35 00
Waverly.....	100	800	0	50	100 00	.....	.....	50 00
Westmoreland.....	42	210	2	150	100 00	.....	.....	20 00
Wellsville.....	200	500	12	250	75 00	.....	.....	.....
Wetmore.....	50	800	14	0	200 00	.....	.....	50 00
White City.....	25	100	2	0	100 00	.....	.....	5 00
White Cloud.....	350	250	7	0	70 00	.....	.....	10 00
Wichita.....	156	832	16	15	1,200 00	500 00	.....	671 00
Williamsburg.....	90	250	4	0	.....	.....	.....	.....
Wilson.....	200	450	4	15	100 00	.....	.....	40 00
Winfield.....	2,000	700	14	270	400 00	.....	.....	125 00
Yates Center.....	200	1,900	12	250	600 00	.....	.....	250 00

TABLE III.

In no particular have the high schools of the state made greater progress than that which is shown in additions to equipment. Over 200 of the schools have laboratory facilities sufficient to conduct a course in elementary physics. During the past year seventy-one high schools of the smaller type have equipped laboratories entire, or in part, at a cost of \$10,168, which is an average of \$143 per school. This addition represents the improvements in one line of science work alone, that of physics. Twenty-five schools report no laboratory facilities whatever in this branch. Forty-nine high schools are well equipped in chemistry, while 189 schools are carrying a course in botany, with a laboratory equipment ranging from \$10 to \$300.

Table III gives a fair idea, also, of the library facilities. Seventy-four of the schools added to their library facilities during the past year, and it has been estimated that such additions have doubled the value of these libraries. Seven schools report no libraries. Before the year is over, however, these schools will have spent from \$50 to \$150 each in the purchase of books.

## Enrolment by Subjects.

<i>Subject.</i>	<i>No. of students.</i>	<i>Subject.</i>	<i>No. of students.</i>
English :		Ancient history .....	4,826
Freshman .....	6,581	Mediæval and modern history...	1,489
Sophomore.....	4,142	English history.....	1,583
Junior .....	2,330	American history.....	1,679
Senior .....	1,386	Economics.....	371
Mathematics :		Physiography .....	3,332
Elementary algebra .....	6,643	Physiology.....	517
Plane geometry.....	3,495	Botany.....	2,609
Algebra (quadratics).....	2,780	Zoology.....	346
Solid geometry.....	1,087	Physics.....	2,185
Trigonometry.....	166	Chemistry.....	668
Latin :		Free-hand drawing.....	626
First year .....	5,220	Mechanical drawing.....	764
Caesar .....	2,804	Manual training.....	1,795
Cicero .....	1,672	Bookkeeping .....	1,719
Virgil.....	726	Shorthand.....	969
German :		Typewriting.....	1,320
Beginning.....	2,323	Commercial arithmetic.....	1,293
Second year .....	931	Commercial geography.....	322
Third year.....	335	Commercial law .....	777
Greek.....	76	Cooking .....	599
French .....	116	Sewing.....	1,013
		Agriculture .....	101

An attempt was made to secure enrolment of the accredited high schools by subjects, but the returns have been so slow in coming in that it is impossible to complete the tabulation at this time. The above table shows reports from 176 high schools and academies. It gives some idea as to the relative numbers carrying work in the different high-school subjects.

The number taking the fourth year of Latin has decreased materially. There seems to be no change, however, in the numbers representing the other three years. Greek has almost ceased to be a high-school subject. Only 27 students are enrolled in this branch, in three high schools of the state, 22 of which number belong to the Kansas City, Kan., high school. The other two schools having classes in this subject are Topeka and Eskridge. The remaining 49 students, which make up the total of 76 in the state, are enrolled in the academies. Of the 116 French students given in this table, 51 are enrolled in high schools. Kansas City, Kan., enrolls 32, Lawrence 7, and Topeka 12.

The German department shows the greatest growth. Last year 123 schools offered courses in this subject, and 44 of them included a third year of work. The returns for the present year show that 144 schools offer German, and 60 of this number include the third year. The total enrolment will approximate 4000 students.

There is also a very noticeable increase in manual training and domestic art and science. Drawing, economics and physiology have made very little, if any, growth. Drawing is not receiving the attention it merits. Only twenty high schools, or less than 10 per cent. of all those accredited, provide for this subject in any form. The reason usually given is the difficulty in securing instructors of other branches who are prepared to teach drawing. Not many of the schools are large enough to demand the entire time of a special teacher for this subject. This difficulty may be overcome, it seems to me, by employing a special supervisor of drawing for the grades and setting apart a portion of the time of such a teacher for high-school classes. Every high-school student should be required to take at least a year of free-hand drawing some time during the high-school course.

## **The Barnes Law.**

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An act which was passed by the legislature of 1905, known as the Barnes high-school law, originated in a wide-spread desire to give public aid to high schools in counties where the county high-school law could not be put into operation. The law bears the name of its originator, Hon. J. S. Barnes, of Pratt, and a brief survey of the local history of Pratt county reveals the fact that on four different occasions an effort to establish a county high school under the provisions of the law of 1886 failed because no agreement could be reached with reference to the location. This is but a repetition of the experience of other counties, and of the twenty-two county high schools now operating under the law of 1886 only two were established by a direct vote of the people. This might be interpreted to mean that the people were opposed to county aid to secondary education, but such is not the case. The whole difficulty hinged on the location of the school.

Mr. Barnes was elected to the legislature in the autumn of 1904, and was made chairman of the education committee when the legislature was organized in January of the following year. He studied secondary-school problems with a view of removing the barrier to further progress under the old law, and introduced into the legislature an educational bill which became a law and which now bears his name. Like many other bills, it did not pass the legislature without much pruning, and when it was printed and had received the signature of the governor numerous modifications had left it more or less obscure as to the meaning of two or three of its most important provisions.

At the first election, which was held in November, 1906, about two-thirds of the counties in the state voted upon the proposition. As a result of this election, forty-three counties were reported to have given the required majorities which would make the law operative. No sooner had the schools begun to organize under its provisions, however, than difficulties began to arise. Some of the railroad companies paid their apportionment of the taxes under protest; in some of the counties the commissioners or members of the local school board, and, in some cases, individual taxpayers raised the question as to the legality of the election.

The point at issue is found in section 7005 of the General Stat-

utes of 1905, which reads as follows: "Whenever a majority of the voters voting in any county, or part of any county to which this law may apply, at such election shall be in favor of such proposition, the provisions of this act shall apply in such county," etc. Of the forty-three counties declaring a majority in favor of this law, only five carried by a majority of *all the voters voting at such election*. Nevertheless, the elections in the thirty-eight counties in which the law received only a majority of the voters voting on this proposition were declared legal by the attorney-general, and schools were organized under the provisions of this law in twenty-nine of the counties which had thus carried the law.

Osage county was the first to question the validity of this procedure, where the subject was taken into court, and Judge Heizer decided that the schools organized under its provisions in Osage county were illegal, on the ground that the law had not passed by the requisite majority. He held that the law was not carried in the county because it had received only a majority of those voting upon *this proposition*, and not a majority of the *voters voting* at said election. Judge Smart, in the district court of Anderson county, gave a similar decision. In September, 1908, this decision was appealed to the supreme court for final action, which was not handed down until December 6, 1908. The ruling of the supreme court sustained the decision of the lower court.

At the special session of the legislature in 1908 the law was amended with reference to this point so as to read: "Whenever a majority of the voters voting upon this proposition in any county, or part of any county to which this law may apply, shall be in favor of such proposition, the provisions of this act shall apply in such county," etc. The state superintendent, Hon. E. T. Fairchild, realizing that the decision of the supreme court referred to above might be adverse, issued a statement to all counties where the law had not passed with the requisite majority, requesting that the proposition be brought before the voters of the county at the November election of 1908. At this writing the report from the counties is not complete, which prevents us from giving the actual results. The following figures will give some idea of the present status of county aid for high schools.

Counties failing to give the required majority.....	26
Counties which carried .....	6
Counties which failed to vote.....	10
Counties not heard from.....	12
Counties in which the law is already operating.....	29
Number of county high schools (law of 1886).....	22

According to the results of this election, six counties passed favorably upon the proposition. Adding to this the number of counties which carried in 1906, we have only twelve counties in which the Barnes law is in legal operation at this time. The counties which are still operating under the law which failed to give the required majority in 1906 are twenty-four in number. The total number of counties which are giving aid to high schools at the present time is in the neighborhood of fifty-seven; it is impossible to give the exact number, since twelve counties have failed to report.

Counties in which the law carried are as follows: Allen, Jefferson, Kingman, Rice, Osborne, Seward.

Counties in which the law is in effect are: Barber, Barton, Butler, Coffey, Comanche, Cowley, Doniphan, Edwards, Finney, Ford, Gray, Hamilton, Harvey, Leavenworth, Lincoln, Logan, Lyon, Marshall, Ness, Pratt, Russell, Saline, Sedgwick, Stafford, Wabunsee, Wallace, Wichita, Wilson, Wyandotte.

Another clause in the law creating some little opposition had reference to the methods of apportioning the funds to the various schools of the county. According to the original act, the treasurer was required to pay to the various school districts a *pro rata* part of the general high-school fund, apportioned to the several school districts according to the average daily attendance, etc. At the session of the legislature of 1907 this clause was amended so as to require the county superintendent "to certify to the board of county commissioners the amount necessary for the maintenance of such high schools for the ensuing year," and also requiring the county commissioners to make such levy, not to exceed three mills. Then again, in the special session of the legislature of 1908, it was made the duty of the county treasurer to pay to the treasurer of each school district "a *pro rata* part of the said general high-school fund apportioned to the several school districts, *according to the estimated cost of maintaining* the high schools for the ensuing year." This is a great improvement over the original plan and is entirely fair and just in its application to the various districts in the county.

By the original law, and in harmony with other laws relating to standards of efficiency, the University was designated as the proper authority in determining the standard of work that should be maintained in a Barnes-law high school. This fact is brought out in two different clauses of the law. In the first article—6995 of the General Statutes—schools, in order to participate in any funds arising under the provisions of this law, "shall have maintained high schools with courses of instruction admitting those who complete the same to the Freshman class of the College of

Liberal Arts and Sciences of the University of Kansas." In section 7002 of the same date, two courses of study are required of each school which is working under the provisions of this law, one of them being "a college preparatory course, which shall *fully* prepare those who complete it to enter the Freshman class of the College of Liberal Arts and Sciences of the University of Kansas."

In determining the standard of work which should characterize these high schools, the law seemed to imply that if a school could offer the minimum number of prescribed units for Freshman entrance to the University, and had been maintaining such a course for at least one year, such a school was fitted to participate in the Barnes-law fund, but as soon as a school had organized under the provisions of this law it must *fully* prepare its graduates for entrance to the Freshman class. The authorities of the University, so interpreting it, determined that a school in order to participate in this fund should have maintained for at least one year a course of study which provided for twelve units of prescribed work, should employ two teachers who should devote full time to high-school work, and who should have for their use such facilities as are necessary to conduct a well-regulated high school. When the school begins to participate in any funds that may be collected under the provisions of this law, the regular requirements for a fully accredited school should apply in every particular. Therefore, a Barnes-law high school which is such in reality as well as in name should employ at least three teachers, should possess for the use of the pupils and teachers the requisite number of reference books, a good working library, and should have a laboratory equipment which should cost not less than \$100. Such requirements seem to be necessary in order to comply with the provisions of the law, and the University has used its influence in every laudable way to establish such a standard in these new high schools and to give every encouragement possible toward inaugurating and maintaining the most approved methods.

One of the most perplexing questions arises out of the application of this law to the small school, and it is at this point more than at any other where the law seems to have become unpopular. The difficulties arise from the fact that the law makes no mention of the number of pupils which should constitute a high school. In the absence of any limit or final authority, it becomes possible to organize a high school with a half-dozen students, with five in the first year and one in the fourth year. Many of the smaller schools, at the sacrifice of the grades, have undertaken to bring about such conditions in the high school as would enable them to receive aid

from the county under the provisions of this law when neither the enrolment nor the teaching facilities would warrant it. The high-school inspector has visited schools, and has received reports from many others, where the number of teachers designated as high-school instructors equaled the number of grade teachers. The enrolment in the high-school in one case was only two pupils, while many schools have sought to come under the provisions of this law with a total high-school enrolment of twelve, ten, and even eight, pupils. Even country districts have put in claims for county aid on the ground that they were taxed and should share in the revenues thus raised, regardless of the clause in the law which requires a college-entrance standard.

The law should be further amended so as to place some limit to the claims of these smaller schools or else make the law apply to any high school that undertakes as much as two years of prescribed work. I believed that it would not only be good economy, but the efficiency of high-school work as it is carried on under this law would be vastly increased if it were so amended: First, that any school in order to participate in county aid should have at least twenty *bona fide* high-school students; second, that there should be at least four teachers in the grades; third, that the taxable property in the district should be sufficient to maintain proper school facilities, including buildings and equipment for the grades as well as the high schools. Statistics show that the number of students in the senior year of high-school work averages about one-sixth of the total enrolment. Should a school be required to reach an enrolment of twenty students it would be fairly reasonable to suppose that there would be enrolled from three to four students in the senior year. Such a number would make it worth while to organize and maintain a fourth year of work. Furthermore, where such conditions as the above exist, the probability is that the enrolment would tend to improve rather than grow less.

It would be difficult at this early date to give any adequate estimate of the importance of this law to the educational interests of the state. It is undoubtedly one of the best measures ever adopted for the improvement of schools in general. It has had a wholesome effect upon grade work, upon higher education, and upon every department of instruction. It has accomplished more toward bringing the higher institutions of learning into working sympathy with the public-school system of the state than any other law on our statute-books. It has brought secondary educational facilities within the reach of rural districts, and where these schools have been organized, in every case, as far as I have been able to

investigate, the enrolment of the school has been doubled, and in a few cases quadrupled. In 1905 Marshall county, with a population of 24,555, had four accredited high schools, with a total enrolment of less than 200. At the present time Marshall county has seven accredited high schools, enrolling 440 pupils, which is an average of one pupil for every fifty-five inhabitants of the county. In Jefferson county, with a population of 12,533, there are seven accredited high schools, enrolling 276 pupils, or an average of one pupil for every sixty-three of its inhabitants. In 1905 Wabaunsee county, with a population of 12,813, did not maintain a single high school that was really worthy of being accredited by the University; at the present time it has five high schools, representing every portion of the county, with a total enrolment of 227 pupils, or one pupil for every fifty-six of its inhabitants. Two years ago the enrolment at Eskridge was twenty-seven girls and one boy; to-day the high school enrolls ninety-one, of which number forty-five are boys. Similar evidences of the wholesome influence of this law upon secondary schools may be pointed out in any of the thirty-four counties where it is in force, and it will certainly be not only a misfortune but a calamity should the results of the recent election turn the tide of public sentiment against this law and its application to the interests of the high schools of the state.

## **School Buildings.**

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One of the most important duties devolving upon any board of education is that of providing buildings in which the children may receive instruction under wholesome conditions. In some states, and in practically all of the large cities, this subject has been given first consideration, and school buildings in these centers of population are the most splendid structures to be found, from the standpoint of utility as well as architectural design. An intelligent public will no longer tolerate the custom formerly practiced of constructing public buildings on unscientific principles, on the grounds of economy. Sanitation is now a department of study in our best institutions of learning. According to the laws of the state of Kansas, cities are obliged to furnish specifications of all public improvements, water-supply, sewage, etc., and must submit them for the approval of expert authority in the interests of good health and public morals. The state law also provides for a state architect, whose business it is to prepare plans and furnish expert advice on the construction of all public buildings to be erected at the expense of the state. These are all wise provisions, because they not only guard the public health in the various communities, but in the end they are more economical.

The state of Kansas is scarcely up to the average in the matter of public-school buildings. The last few years might be designated as a building period, and yet, barring a few notable exceptions, the school architecture of the state does not show any very marked improvement. School architecture involves far more than the laying of deep foundations and erecting upon them solid walls. Ventilation, light, heating facilities, roomy stairways, study-hall and laboratories are some of the subjects that demand special consideration in the erection of a well-appointed high-school building.

In visiting over 200 high schools in Kansas, naturally my attention has been directed more or less to the general appearance, materials of construction and the arrangement of rooms in these buildings. While there has been great improvement in certain localities of the state, especially in the large cities, yet one is often impressed with the cheapness of construction, crude finish and incompleteness of furnishings. The facilities for lighting and ventilation have received most attention. Seventy-eight high schools in the state have installed good systems. These are

mainly the fan system and the Lewis & Kitchen heating and ventilating system. Seventy-three high-school buildings have no special means of ventilation other than from the doors and windows, and in most cases the air in the rooms was found to be impure and unwholesome. There is no question but that the attention of school boards should be directed to this imperative need. It is unnecessary to set forth reasons for demanding pure air in the schoolroom; these are understood by most people. The most effective method of construction to secure results, however, is another question. At this point the expert architect should be consulted. Narrow halls and small recitation-rooms (some of the later sometimes formed by setting off a portion of the hallway) are by far too common. In seven of the middle-sized high schools recitations are held in basement rooms with low ceilings and damp walls, where wholesome conditions for mental work are practically impossible.

It is unnecessary to enumerate facts any further to bring the attention of superintendents and school boards to this very important question. One thing, it seems to me, should be urged, and that is that in the construction of all new school buildings school boards should seek the very best advice obtainable on the subject of plans and specifications. In every case the service of an expert architect, one who is thoroughly versed in the subject of school architecture, which involves an accurate knowledge of all the subjects mentioned above, should be secured.

Very often school boards write to this office asking for suggestions with reference to plans for a new building, and this leads me to suggest that it might be a wise plan for the state to provide for the appointment of a competent person, who has made a study of all matters pertaining to the structure of school buildings, to whom the school boards of the state might look for advice, or, perhaps, for the best plans for buildings. Much good would undoubtedly be derived from the appointment of such an officer, and the patrons of the school and the public in general would feel that the health of their children was safeguarded in the public schools, as it is in the various state institutions. If such a scheme as the above is untenable, it would be a good plan for the State Board of Education to issue a pamphlet devoted entirely to the subject of high-school architecture.

To further emphasize the practical phase of this subject I desire to quote the following data from Morrison's "Ventilation of School Buildings":

"The number of cubic feet of air vitiated by each child in one hour is 2000. In high schools, where pupils are large, it would be more nearly correct to use 0.6 of a cubic foot as the amount of

CO<sub>2</sub> evolved by each; and in colleges 0.7 of a cubic foot, the amount given off by adults. These conditions, then, would require, respectively, for small children, 2,000 cubic feet per head; for high-school pupils, 3000 cubic feet; and for college students, 3500 cubic feet. In a schoolroom of ordinary size there are 28x34x14 or 13,328 cubic feet of air. From the foregoing it is seen that each child requires 2000 cubic feet of pure air per hour; sixty children—about the average school number—will therefore require the same amount in one minute. It is plain, then, to see that the air in the average schoolroom, were there no means for ventilation, would become vitiated in less than seven minutes:  $13,328 \div 2000 = 6.66$  per minute. It appears evident, then, that in order to meet the requirements of perfect ventilation the air in the room must be changed every seven minutes, and the total amount of fresh air which must be passed through a schoolroom of ordinary capacity and occupancy is  $2000 \times 60 = 120,000$  cubic feet per hour.

## **The Small High School.**

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Kansas has no large cities, consequently her educational problems are not such as would naturally grow out of schools in congested districts or localities where the conditions of living are complex and interfere with the progress of normal educational forces. In the great majority of Kansas school districts the people are either engaged in agricultural pursuits or else they are directly dependent upon those engaged in agricultural pursuits, as common laborers, artisans, or merchants who establish and maintain centers of trade for the mutual exchange of common commodities. Life is therefore simple, occupations are permanent, populations are not liable to periods of abnormal increase or decrease, and the social fabric is comparatively free from disturbing influences of a political or financial character. Such conditions have a very wholesome effect upon public education and public morals. Here we find sincerity of purpose a ruling motive, industry a habit, and obedience the first law of conduct. There is not much in the life of such communities to tempt the young boy or girl away from the routine of the school program and the duties consequent thereto.

From schools conducted in these small centers of population, with an enrolment of one-third the total high-school enrolment of the state, the University draws 56 per cent. of its students. The following figures will reveal some facts worthy of attention. Two schools of the state, namely, Topeka and Kansas City, Kan., approximately reach an enrolment of 1000 students; Wichita enrolls 720, Lawrence, 539, while the remaining schools do not reach the 400 mark, four of which, only, exceed an enrolment of 300 students. Thirty-eight schools have an enrolment ranging from 100 to 200, while 166 schools, or more than 72 per cent. of the total number of accredited schools, enroll less than 100 students each. The total enrolment of these 166 schools is 8011 students, or a little more than 36 per cent. of the total enrolment.

One cannot read these statistics without realizing the importance of the small high school in dealing with the educational problems of the state. The great majority of these small high schools are fairly equipped and are improving conditions each year. Many of them employ three or more teachers; they are demanding a higher grade of teaching, and through the extension work of the University the standard of scholarship is rapidly approaching that of the

largest and best high schools. It is not uncommon in this type of school to find in good working order all the various organizations that are usually considered a part of high-school work, such as athletics, literary societies, reading-clubs, musical organizations and oratorical associations. School spirit is active and wholesome and carries the interest of school life back to the homes. The influence of the small high school is far-reaching and is destined to be an institution of greater significance in the social life of the state than can be estimated at this time.

## **Committee on Recommendation of Teachers.**

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A committee on recommendations exists at the University of Kansas, to assist superintendents and boards of education in securing the best available high-school instructors. Among those enrolled in the various departments may be found graduate students, some of whom have had successful experience as teachers; members of the Senior class who by the end of the year will have completed the course in pedagogy and who have in most cases specialized in some line of high-school work, and undergraduates who desire to teach for a year or more before completing their course at the University. The committee on recommendation of teachers enrolls candidates from these three classes of students, and before making recommendations to boards of education seeks advice from the various departments of the University with reference to the specific qualifications of each.

The secretary of the committee keeps complete records of scholarship and other qualifications of all persons registered as candidates for teaching positions and undertakes to answer inquiries and furnish such information as will be helpful to school authorities in selecting their teachers. The University offers its services gratuitously and invites correspondence with any board of education or city superintendent in need of high-school teachers. The committee consists of the following persons: Prof. W. H. Carruth, Prof. Arvin S. Olin, Prof. W. C. Stevens, Prof. Olin Templin, and Prof. W. H. Johnson, the high-school visitor. The officers consist of chairman, Professor Templin, and a secretary, who is the high-school visitor.

The committee holds regular weekly meetings during the months of April, May and June.

The following method of procedure is pursued in recommending candidates for high-school positions: In case a board of education makes application to the committee for advice or recommendation, the committee selects the most suitable person for the position in question from its list of available teachers and instructs the secretary to communicate with the board of education, which becomes the official recommendation of the University.

In the case of vacancies in the office of superintendent in cities of the first and second classes the following method of procedure is adhered to by the committee:

- (a) On application for advice or recommendation from the Board of Education to the University: (1) If the board ask for a nomination, the committee will undertake to submit a name if a suitable person is known to them. (2) If asked by the board for its estimate of a given candidate or candidates, the committee will give its best opinion, and may name a preference if conditions warrant.
- (b) On application from a candidate to the University: (3) If unanimous in its indorsement the committee will support the application. (4) If the committee does not agree unanimously to indorse, then individual members of the committee or other members of the Faculty are at liberty to write as individuals.
- (c) On applications made to individual members of the Faculty: (5) So far as these are in the nature of private communications, the committee merely offers its service and its information to those desiring them; it suggests that members of the Faculty would do well to consult with the committee and give notice to the committee of replies sent in such cases, in order to avoid possible conflict with action of the committee, which might neutralize the action of both.

In (1), (2), (3), individual members of the Faculty may write individual letters in accord with the action of the committee.

The procedure of the committee is the same as above in all cases of applications for positions as teacher or principal, save that in (3) the committee acts by majority vote.

The experience of the committee has proved that a general letter of recommendation has but little weight, and, therefore, letters of this character are not written except in very rare cases. It might also be added that members of the Faculty quite generally observe the same custom.

All communications should be directed to The Secretary of the Committee on Recommendations, University of Kansas, Lawrence.

While it is impossible to measure the influence of this committee with school boards and superintendents in the placement of teachers, some estimate may be formed from the following data, which represents the scope of the work during the past year, ending December 1, 1908. The total number of candidates enrolled for teaching positions and who had filed information with the secretary of the committee was 178. Of this number 147 were graduates of the University, while 31 had completed their collegiate

work in the other institutions of the state. The colleges represented were Ottawa, Fairmount, Bethany, Emporia, Baker and Southwest Kansas. Practically all of this number were college graduates. Some of those enrolled from the University had completed a course at the State Normal School before entering the University. More than one-half of the number were teachers of experience and were seeking merely to better their conditions.

The total number of applications to the committee for recommendations coming from school authorities was 228. This includes requests for superintendents, principals, and instructors for practically all of the departments represented in high-school work. The demand during the past year for teachers of science and for male teachers was far greater than the supply, so that some of our best schools were obliged to seek teachers from institutions outside of the state. The number of positions filled upon the recommendation of the committee was 126. This number might have been increased very materially if the committee could have supplied the demand for science teachers. Judging from the demands made upon the committee for teachers covering the various departments in the high school, we may properly infer that there is a real need, in the first place, for men of executive ability in high-school work. There is an effort being made to secure more men teachers for the larger high schools, and the ratio of the men to the women in the high school has been increased very much during the past year. For the year 1907-'08, 33.3 per cent. of those giving instruction in the high schools were men, while during the year 1908-'09, or the present year, 42.1 per cent. are men—the exact figures for the present year being, men 418, women 575. There are three reasons which may be given for this large increase—the better salaries, the determined effort upon the part of school boards and superintendents to increase the number of men in their teaching force, and, finally, the depression in the business world, which made it difficult for young men to get employment in other lines of work.

Again, the increased demand for science teachers was especially characteristic of the requests which came to the committee during the past year. It will be well for the colleges and the University to take notice of this increased demand and make the facts known, as far as possible, to students who are pursuing courses with a view to teaching.

This committee, while organized under the authority of the University, and while having a special interest in the graduates of this institution, places even above these facts the real good of the high

schools of the state, and in making recommendations seeks first of all the good of the school, and, second, the interests of the individual candidate. While the committee does not seek candidates for teaching positions from other than the graduates of the University, it has in many cases enrolled teachers from other institutions, and does so as a matter of courtesy. The demand made upon the committee is far greater than the University is able to supply from its own graduates, and, therefore, if it may serve the teachers already occupying positions or graduates of other institutions by placing them in communication with school authorities, such favor will be freely granted, in the belief that it will be for the best interests of the high schools and a welcome assistance to any one seeking a position.

The several departments of the University which give attention to the training of students for teaching in any special line of work make certain requirements before any candidate is endorsed for a position to teach in a high school. While these requirements are not always the same, varying somewhat with the character of the subject, in general they may be stated thus: Any graduate of the University, before he can secure the recommendation of the department for a teaching position, is required to devote at least twenty-five hours to the special subject in collegiate work alone, or in addition to entrance requirements (twenty-five hours being the equivalent of two and a half years' work). In addition to these twenty-five hours, each candidate is required to take a teachers' course, which is conducted especially for those who look forward to teaching, and offers an opportunity for a limited amount of practical experience. The departments of the University which make these requirements are German, English, Latin, French, mathematics, chemistry, history, and entomology, and the work is carried on in coöperation with the department of education. A description of the requirements in each of these departments will be found on pages 129 and 130 of the General Catalogue. It is not always possible to recommend a teacher who has fulfilled these requirements; in this case the exact facts are made known to the superintendent or school board seeking a teacher.

School authorities, and especially school boards, who are not, as a rule, familiar with the requirements for teaching positions, have seemed to appreciate the frankness and fairness with which their interests have been guarded in dealing with the appointment committee. So much has the committee been impressed with this fact that it has suggested to the colleges of the state that it might be wise to unite upon a plan similar to the one outlined above. This

would complete a uniform relationship between the high schools and all of the colleges of the state, with reference to the standard qualifications of high-school teachers. The average school board desires to secure the most efficient instructor, while the colleges look forward to a high standard of preparation from those who enter the Freshman classes. After all, it is a mutual affair; what is best for the high school will also bring good to the colleges. The idea is not to encourage high-school teachers to specialize to the extent that they would be impractical, or that they would be unable to carry an additional line of work in case there was a demand for it; but it is the sincere purpose of all high-grade schools to secure teachers thoroughly qualified in at least one line of educational work. Members of the Faculty of the University who have given this subject much thought have estimated that twenty-five hours is the minimum amount of work to secure the standard of efficiency which should prevail in all accredited high schools.

The committee desires to communicate with any school board or superintendent of city schools who is seeking teachers for high-school positions, and will also be glad to place on file the names of any persons who wish to become candidates for positions. Under no conditions, however, will inexperienced teachers be recommended for positions unless there is a personal acquaintance with some member of the committee, and unless there is on file in the office of the secretary testimonials bearing the authority of the institution from which they graduated. Respectfully submitted.

WM. H. JOHNSON, *High-school Visitor.*

Lawrence, Kan., January 1, 1909.



## Part II.

### The Biological Laboratory.

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There is now practically no dissension among teachers that the study of biology, namely, of plants and animals, should in our high schools be primarily concerned with plants and animals themselves. Text-books and books of reference are needful, but they should not be made the whole thing nor the main thing.

Let us suppose a teacher has been elected to teach botany in a high school where no thought had been given to this subject in planning the building and in equipping it. This is the rule at the present time. If the teacher proceeds to teach as the conditions suggest, the pupils will sit at their desks and drone out lessons conned from a book. No dead language is half so dead as is this kind of botany. The teacher confronted with such conditions must proceed to change them. He must present to the superintendent and the school board the absolute necessity of a laboratory room with sufficient table-room and light to carry out careful work with simple dissecting microscopes. The sloping tops of ordinary school-desks are not adapted to the work, neither are desks and tables placed remote from windows. The equipment of a suitable laboratory does not need to be expensive. Some of the wealthier high schools have tables covered with plate glass or slate. This is luxurious, and the money could have been spent more wisely in the purchase of microscopes, stereopticon and illustrative materials of various kinds. A very satisfactory table is one with a plain wood top that has been treated with a dead-black waterproof dressing. The method is this: The top is planed and sandpapered and given two coats of a hot solution of 250 grams of commercial copper sulfate and 250 grams of potassium chlorate in 2000 c.c. of water. After this has dried put on, one coat of 100 c.c. of commercial aniline and 100 c.c. of commercial hydrochloric acid in 2000 c.c. of water. Let this dry twenty-four hours, and oil the tops with boiled linseed oil; and when this is dry wash the tops well with hot soapsuds.

The dissecting microscope is a necessary part of the laboratory equipment that has been too much neglected. The high school

may reasonably be expected to supply these, one for each student. The pupil can hardly be expected to buy for himself a microscope adequate for the purpose, and when he is left to supply himself he gets, as a rule, a cheap lens without proper mounting to secure accurate focussing and leave both hands free for the use of the dissecting needles. Fortunately an all iron and brass dissecting-stand with rack and pinion adjustment for focussing, equipped with an excellent doublet lens and hand-rests, can now be obtained for \$2.50. This is not a miniature microscope, but is large and solid, and is built to last an indefinite number of years. (Address C. W. White, instrument maker, University of Kansas, Lawrence.) Thus, a laboratory could be equipped with twenty microscopes for only fifty dollars; and the number of pupils in the laboratory at any period under the supervision of one teacher should not exceed twenty.

The dissecting-needles are very easily and cheaply provided. Get Dixon's Artisan lead pencil, No. 268, having a rubber inserted at one end. Cut the pencil in two and thrust a strong needle, eye foremost, into the rubber. The pencils cost ten cents per dozen, and a pair of dissecting-needles can be made in this way for less than three cents. The necessary laboratory equipment is seen to be simple and cheap, and no high school need fall short of it.

As for materials for study, the world is teeming with them, and a judicious selection must be made. If the teacher has no plans of his own, he can follow any good text-book offering laboratory directions. There should assuredly be a plan well thought out beforehand and the way made clear for providing materials as they are needed. In the study of seeds and seedlings, the text-books usually recommend Lima beans, Indian corn, castor-beans, and sometimes pine. Add to these English walnut, date and peach. The walnut and peach should be planted out of doors in the fall, and they will germinate the following summer, when they can be preserved in formalin (one part of commercial formalin in twenty parts of water). The dates will germinate in the garden in summer if kept moist, and they also should be kept in formalin. Summer and fall are the harvest seasons for the teacher of botany, when a rich stock of materials should be laid in. Corn and wheat in bloom should be preserved in formalin and used in the study of improvement in cereals, of which so much can now be learned from the Experiment Station Bulletins, the United States Agricultural Reports, Bailey's and de Vries' Plant-Breeding, and the Cyclopædia of Agriculture. A variety of fleshy fruits should be preserved in formalin, and dry fruits in pasteboard boxes. Mosses,

ferns and fungi should be put into formalin or dried, as the particular case demands, and leaves parasitized by mildews and rusts should be dried in the plant-press. It will be seen that, if the course is planned in time, there can be provided an abundance of materials for a splendid year's course. Unfortunately, as things go, the teachers are shifting about from year to year, and often the teacher finds out only at the last minute that he is to take charge of botany. In cases of this kind it is the superintendent's business to see that his school is adequately provided for the year's work. It must be realized that in the sciences the machinery is not so automatic as where the text-book and the library contain the substance of the course. To prepare for a course in science is relatively costly in money and time, and where these are not expended there can be no worthy teaching.

Let us indulge in the pleasing imagination of pupils at work in a well-equipped laboratory on a course thoroughly planned and provided for—what should be said about their method of work? Shall they construct a laboratory book with drawings and notes? And of what sort should the drawings and notes be? Before we answer these questions we must be clear about the main purpose of the laboratory work. It is that the pupil may see for himself the facts of plant life as a proper basis for any right thought about it. But there is another side to the problem. Laboratory work of any kind, whether in science or history or literature, gives training in independent work that is the best part of education. The more exactly and thoughtfully this work is done in any field the greater is its educational value. Now it is just here that the use of drawings in laboratory work in botany comes in. To make them right requires, not skill in drawing, but careful and thoughtful observation. The requirement of them compels the pupil to give attention to his problem, and by them the teacher is enabled to know quickly how well the pupil has observed, and the pupil himself has a basis for comparing his conceptions with the actual facts. It is a well-recognized truth among educators that a right conception of a new fact is oftentimes of slow growth, and the drawings required in the botany laboratory are intended to insure and accelerate this growth. Such being the purpose, we can see of what sort the drawings should be. First of all, they must be accurate. A truthful representation of the facts with which the study is primarily concerned they must assuredly be. Take, for instance, a median longitudinal section through a grain of corn; the pupil is apt to overlook the root-sheath altogether, and the fact and manner of junction of the cotyledon with the caulicle. Or, in a longitudinal

section of a bud, he may fail to see that the outermost scales are the lowest and shortest, while the others are borne at successively higher nodes. These are not mere finical details that might as well be passed by, for a conception of the real nature of a bud, as composed of a succession of embryonic nodes, internodes and leaves, cannot be had without them. And so, for any piece of work, accuracy of details will be found necessary to the accomplishment of anything worth while; and, more than this, if the pupil's work represents a series of only partial truths, his interpretations will as likely as not be absolute untruths.

And then the drawings should be neatly done and well arranged on the page, not only in deference to the personal pride and æsthetic sense of the pupil and of the teacher who must examine his work, but also that slovenly habits of doing things may not be fostered here. When the pupil is made to be accurate and neat in his work, his interest in it begins to pick up and his respect for it grows at the same time.

A hard lead-pencil is a good drawing medium, but the pupil must be cautioned not to dig into the paper with it. Drawings very lightly done with a medium-hard pencil and then retraced with India ink are vigorous and lasting. Many schools have adopted this way. A soft pencil is too smeary to be tolerated.

The laboratory notes stand close in importance to the drawings. The details of the latter should be lettered with the same medium used in drawing, hard pencil or India ink, and the notes should first state what these details are. Then should follow the object of the particular study, what was learned by observation, and the conclusions to be drawn therefrom. A good criterion of the success of the laboratory book would be this: Whether any intelligent person examining it could find in each study, clearly set forth, a reasonable purpose, a thoughtful pursuit of it, and a logical and significant conclusion. Would this be the case if the drawings are inaccurate and the notes haphazard and incomplete? Inking the drawings and writing the notes are to be done outside the laboratory period, which is much too short to be curtailed by anything apart from observational work. The writer shall never forget a class incident of his college days. A student had just made a careless recitation. The teacher rose on tiptoe, and, punctuating each word with a vigorous blow of his clenched fist into the air, thundered: "Think! think! think!" This might well be inscribed on the laboratory wall. The work there of the pupil is too apt to fall into thoughtless, and even sightless, pothering over the object in hand. Let the requirements be exacting and rigorously enforced. Let the

pupil understand that when, at the close of the term, he hands in his laboratory book for the final grading, he is presenting something pervaded by his own personality. Shall it show zeal for knowledge, capacity for hard and critical work, ability to think straight, and an æsthetic sense? Or shall it show a complete lack of intellectual curiosity, laziness, and shiftlessness, aversion to or inability in thinking, and æsthetic blindness?

## **Materials for the Study of Zoology.**

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(Supplemental to the section on "Materials," High-School Manual, No. IV.)

Realizing the difficulties under which the subject of zoölogy is taught in the secondary schools of the state, the University during the past few years has lent such assistance as was possible by supplying materials, furnishing general directions for laboratory work, and suggesting reading-lists. The demands upon the department of zoölogy at the University for assistance of this character have now become so numerous that it is thought advisable to make more definite statements regarding some of these matters in the High-School Manual.

Many schools do not offer a course in zoölogy, largely because of the difficulties in getting the necessary specimens for laboratory work and demonstrations. The University is now in a position to supply these materials at prices that will permit any properly prepared high school to give an elementary course in the subject. It is the purpose of the University to furnish these supplies at cost, and, as more collections are made directly by the school, the prices charged will become lower. At the present time these average considerably less than those of the dealers, and in addition the heavy transportation charges of long shipments are avoided. It is not thought advisable now to publish a price-list. For a few dollars enough material may be secured to supply the ordinary high-school class. This may be ordered directly, or prices will be furnished upon application. Any of the specimens suggested for use in the Manual can ordinarily be supplied at once.

If high-school teachers do not desire to make out lists of specimens needed, and will send in a statement regarding the number of students in class, the amount of money available, and the general character of the course, the University will forward suitable materials. Representatives of most classes of animals are on hand and can be furnished in reasonable quantities. Each student should have at least one specimen of every type studied, and it is better to provide two. It is also advisable to have single representatives of groups nearly related to the type, with which to establish principles of classification. Demonstration sets of this kind can also be furnished, and, if desired, these specimens can be permanently mounted.

(Supplementary to the section on "Outline of the Course.")

The laboratory work, to be of most service, should be conducted so as to demand the utmost care and accuracy on the part of the student. Hasty and inaccurate sketches are of no value; they are even detrimental. Better a few neat and precise drawings than many erroneous ones. To foster this sort of work every part drawn should be carefully measured. A strip of paper and two long, slender pins are all the instruments required to secure accurate measurements. No shading or perspective should be employed, and every part of the specimen should be fully extended in the plane from which the specimen is viewed. For example, in making a drawing of the dorsal side of an animal, only this aspect of the various parts should appear. The paper upon which the drawings are made should be of a good quality, with a smooth, hard surface. Care should be taken to see that the finished side of the paper is used. Samples of the paper used at the University will be sent upon application. It is better to put explanations on an opposite sheet rather than upon the drawings themselves. Inconspicuous index characters can be placed upon the parts of the figure and explained in detail upon the opposite page.

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## **English Composition in the High School.**

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Pupils entering the high school from the grades should have read a reasonable number of suitable classics and other books of literary quality supplementary to the regular school texts. They should have studied grammar and composition together, without other text-book at first than a good set of language lessons, afterward reviewing each subject with a suitable elementary text. They should have had constant practice in oral and written expression, and as a result of it should be able to speak and write freely, easily and with reasonable correctness about anything that comes into their experience, including, of course, the books they read. They should be able to punctuate and capitalize well, should have a fair vocabulary, should know something of the theory as well as the practice of making sentences, should know how to organize such material as they have been working with, and should understand the elements of versification.

In beginning composition work in any class or school, pupils should first of all study the conditions under which they are then or in future to speak and write, and thus determine what types of discourse to begin with and what sort of material to use. This will naturally lead to abundant oral exercises, some conversational and some more formal, chiefly of narrative, descriptive and expository type; and to a good deal of letter-writing, addressed to friends or to members of a real or imaginary larger public; then to addresses, articles, essays, and verse exercises, adapted to the same and then to a larger or more general public—but always to the saying of a specific thing to a specific person or body of persons under specific and clearly realized conditions.

After that, attention should be given to the organizing of material with reference to its character and the conditions to be met—the time, place, and public addressed; and this will lead in logical order to the study of outlining and proportioning, of sequence, paragraphs, sentences, and vocabulary; and thus there will be ample opportunity for reviewing again, as necessity may arise, any and all matters that formed a part of the grade course. After that, the more important literary species may be taken up, beginning with the more familiar, for the more intensive study of the structure of each, and especially of the nature and principles of the discourse forms that enter into each. Here, again, the more

free types, expository, narrative, and descriptive, will precede, and the more formal expository and argumentative types will follow.

Always, and especially at first, a large proportion of the high-school work in composition should be oral, ranging from informal conversational exercises to the formal oral presentation of material thought out beforehand, but not written down. The collateral reading of classics should be utilized as illustrative of species, of structure, of discourse forms, and also as one among many sources of material. Among oral exercises, reading aloud and free translation, transliteration and paraphrase may have a useful place; and among written exercises, studies in verse should have their share of attention. Not more than a few minutes of a class session should be spent in formal recitation upon the subject-matter of any text; the time should be given almost wholly to the practical application of principles in some sort of exercise, oral or written, and to incidental discussion and criticism.

In presence of a class, the teacher's criticism of exercises should chiefly be concerned with pointing out the special merits of such as can be presented or read, leaving defects to reveal themselves through the contrast of inferior with better work. There must, of course, be exceptions to this rule, but never so made as to hurt or discourage a pupil. Such exceptions should commonly be made with reference to faults common to several pupils or to an entire class. In private criticism, the teacher may point out to a pupil errors in the application of such principles as the exercise was intended to illustrate, or such as have been studied earlier. Other errors he should, as a rule, ignore for the time, and he should always take pains to observe and commend good points.

Each member of a high-school composition class should, as a general rule, prepare each week one written exercise of some length, ordinarily 200 to 500 words. Other exercises than this should be short and simple and often purely oral, requiring little criticism or discussion, if any, outside of the schoolroom. Even thus limited in number, the written exercises of a class are usually too many for the teacher to read carefully and correct or criticize; for the maximum rate for a skilled reader of such exercises does not exceed 2000 words an hour. School boards should see to it that there are enough teachers of English composition to handle all manuscript in this thorough way, and should count all manuscript-reading time as laboratory teaching. Otherwise the subject cannot be properly taught, and in dealing with papers the teacher must resort to all sorts of makeshifts at the sacrifice of thoroughness; for no

matter how large composition classes may be, it is usually inadvisable to reduce the number of written exercises, whether shorter or longer, below the minimum of one a week.

For instance, the teacher may read part of a set of exercises carefully, and another part rapidly for general suggestions only, leaving the rest of the set entirely unread. Next time he should read the papers of students whose work was not examined the first time, and so on till each pupil has had his share of attention. Then he may go through the class in rotation again, but not in the same order as at first, so that no individual pupil may know just when his own paper is to be examined and when passed over. In a still slower rotation, the teacher should meet each member of his class in private personal consultation, to talk over all the pupil's work up to that time, point out possibilities of improvement, make helpful suggestions and give encouragement.

Sometimes a few of the best students in a class may be appointed to assist the teacher in manuscript reading, and excused for the nonce from their own written work; the appointment to be held for only a limited time by any one pupil. Such readers should give attention chiefly to the correction of errors in spelling and capitalization, grammar, sentence-structure and punctuation. The teacher should then reread rapidly as much as possible of the manuscript, taking note of general arrangement, paragraphing, matters of taste and style, and such general principles as the exercise was intended to illustrate. Very few readers, however, will be found reliable enough to be of real help.

Occasionally it is a good thing to have pupils exchange papers and criticise one another's work; but in this case the chief benefit comes from criticising, not from being criticised, and the papers need to be reexamined when practicable.

## **A Suggestive List of Books for a High-school Library.**

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Teachers have frequently written to the University for advice in regard to the selection of books for a high-school library. It is in response to these letters of inquiry that the following suggestive list of books has been prepared and is here offered for the use of superintendents and principals of high schools.

It is not necessary that the high-school library contain a large number of volumes; such a library should consist in the main of books that bear directly upon the work of the various departments of the school. It should be a library which is adapted for school work rather than for the general reading public. The volumes contained therein should offer a larger discussion of the subjects treated of in the texts, and should cover a limited range of collateral reading. Some of the larger schools would do well to have several copies of the same book; especially is this true of the English classics. The list submitted herewith has been prepared with these ideas in view. It will be noticed that the department requiring a great amount of general reading, as English or history, is represented by a large number of books, while in the sciences only a few are mentioned. Since the funds in most of the schools are limited, it would be advisable to add at first a few books from each of the departments represented, and to increase this each year or as rapidly as funds will permit. The books listed for the departments of English, the classics and history show the name of the publisher, the price and the date of publication, while in the other departments only the name of the publisher is given. Where the name of the publishing house is not given, it will be necessary to consult the local book dealer or the publishing house of A. C. McClurg, of Chicago, the latter being able to give information in regard to almost any book published.

### **ENGLISH.**

For the study of English, the laboratory required is a well-equipped library, and the following list has been prepared in response to many letters of inquiry as to what such a library should contain in addition to dictionaries and standard editions of the works of English writers. Besides collections of verse and prose,

the list includes classified titles of valuable reference works in fifteen or more subjects belonging to English literature, English composition and English language. Books of special importance in each of these subjects are marked with an asterisk, and the books so marked are for the most part inexpensive.

### I. HISTORIES OF ENGLISH LITERATURE.

- \*Saintsbury.—Short History of English Literature; Macmillan, 1898; \$1.50.
- Engel.—History of English Literature; Dutton, 1902; \$3.
- Garnett and Gosse.—History of English Literature; Macmillan, 1903; 4 vols., each \$6.
- \*Saintsbury.—History of Nineteenth Century Literature; Macmillan, 1896; \$1.50.
- \*Gosse.—History of English Literature in the Eighteenth Century; Macmillan, 1891; \$1.
- \*Saintsbury.—Elizabethan Literature; Macmillan, 1887; \$1.50.
- Brooke.—History of Early English Literature; Macmillan, 1892; \$2.50.
- \*Brooke.—English Literature from the Beginning to the Norman Conquest; Macmillan, 1898; \$1.50.
- \*Schofield.—English Literature from the Conquest to Chaucer; Macmillan, 1906; \$1.50.
- \*Ten Brink.—History of English Literature; Holt, 1893-'96; 3 vols., each \$2.
- Morley.—English Writers; Cassell, 1887-'95; 11 vols., each \$1.50.
- Taine.—English Literature; Holt, 1871; \$1.40.
- Cambridge.—History of English Literature; Putnam's; 14 vols., (2 published), each \$2.50.

### II. WORKS ON AMERICAN LITERATURE.

- \*Richardson.—American Literature; Putnam's, 1891; \$3.50.
- \*Tyler.—History of American Literature During the Colonial Time; Putnam's, 1878; \$3.
- \*Tyler.—Literary History of the American Revolution; Putnam's, 1897; 2 vols., each \$1.50.
- \*Wendell.—Literary History of America; Scribner's, 1900; \$3.
- \*Trent.—History of American Literature; Appleton, 1903; \$1.40.
- Sears.—American Literature in Its Colonial and National Periods; Little, Brown & Co., 1902; \$1.
- Fisher.—A General Survey of American Literature; McClurg, 1899; \$1.
- Onderdonk.—History of American Verse; McClurg, 1901; \$1.25.
- \*Stedman.—The Poets of America; Houghton, 1885; \$2.25.

- \*Stedman.—An American Anthology; Houghton, 1900; \$2.
- \*Holliday.—History of Southern Literature; Neale Publishing Company, 1906; \$2.50.
- \*White.—Philosophy of American Literature; Ginn, 1891; 30 cents.
- \*Page.—The Chief American Poets; Houghton, 1905; \$1.75.
- Carpenter.—American Prose; Macmillan, 1898; \$1.
- Bowen.—Makers of American Literature; Neale Publishing Company, 1908; \$2.50.

### III. SPECIAL WORKS AND BIOGRAPHIES.

- Crawshaw.—The Making of English Literature; Heath, 1907; \$1.25.
- \*Gosse.—History of Modern English Literature; Appleton, 1898; \$1.50.
- Hales.—Handbooks of English Literature; Macmillan; a series, each vol. about \$1.
- Courthope.—History of English Poetry; Macmillan, 1903; 4 vols., each \$3.25.
- Saintsbury.—History of English Prosody; Macmillan, 1906-'08; 3 vols. (2 published), each about \$3.50.
- Traill.—Social England; Putnam's, 1894-'97; 6 vols., each \$3.50.
- Perry.—English Literature in the Eighteenth Century; Harper's, 1883; \$2.
- Beers.—History of English Romanticism in the Nineteenth Century; Holt, 1901; \$1.75.
- Jusserand.—Literary History of the English People; Putnam's, 1894; 3 parts (2 ready), each \$3.50.
- \*Bascom.—Philosophy of English Literature; Putnam's, 1874; \$1.50.
- \*White.—Philosophy of English Literature; Ginn, 1895; \$1.
- English Men of Letters Series; early issues, Macmillan; each 40 cts.
- English Men of Letters Series; later issues, Macmillan; each 75 cents.
- Great Writers Series; W. Scott, London; each about 75 cents.
- Great Writers Series; cheaper edition, W. Scott, London; each 40 cents.
- American Men of Letters Series; Houghton; each \$1.25.
- Vedder.—American Writers of To-day; Silver, Burdett & Co., 1895; \$1.50.
- \*Scudder.—Social Ideals in English Letters; Houghton, 1898; \$1.75.
- \*Tucker.—The Foreign Debt of English Literature; Macmillan, 1907; \$2.

## IV. HELPS IN THE STUDY OF LITERATURE.

- \*Ryland.—Chronological Outlines of English Literature; latest edition, Macmillan, 1907; \$1.40.
- \*Whitcomb.—Chronological Outlines of American Literature; Macmillan, 1894; \$1.25.
- \*Heydrick.—How to Study Literature; Hinds, Noble & Eldredge, 1902; 75 cents.
- Painter.—Elementary Guide to Literary Criticism; Ginn, 1903; 90 cents.
- Crawshaw.—Interpretation of Literature; Macmillan, 1896; \$1.
- Fleming.—How to Study Shakspeare; Doubleday, Page & Co., 1902-'03; 4 vols., each \$1.
- \*Carpenter, Baker and Scott.—The Teaching of English; Longmans, 1903; \$1.50.
- Chubb.—The Teaching of English; Macmillan, 1902; \$1.
- \*Gayley.—Classic Myths in English Literature; Ginn, 1893; \$1.65.
- Guerber.—Myths of Greece and Rome; American Book Company, 1893; \$1.50.
- Guerber.—Myths of Northern Lands; American Book Company, 1895; \$1.50.
- Guerber.—Legends of the Middle Ages; American Book Company, 1896; \$1.50.
- \*Skinner.—Myths and Legends of our Own Land; Lippincott, 1896; 2 vols., each \$1.50.

## V. WORKS ON ENGLISH VERSE.

- Corson.—Primer of English Verse; Holt, 1892; \$1.25.
- \*Gummere.—Handbook of English Verse; Ginn, 1885; \$1.
- \*Alden.—Specimens of English Verse; Holt, 1903; \$1.25.
- Gayley and Young.—Principles and Progress in English Poetry; Macmillan, 1905; \$1.10.
- Gummere.—The Popular Ballad; Houghton, 1907; \$1.50.
- Gummere.—Old English Ballads; Ginn, 1894; 80 cents.
- Clark.—History of Epic Poetry; Simpkin, Marshall, Hamilton Company, 1900; about \$1.
- Stedman.—Nature and Elements of Poetry; Houghton, 1892; \$1.50.
- \*Stedman.—The Victorian Poets; Houghton, 1887; \$2.25.
- \*Stedman.—A Victorian Anthology; Houghton, 1895; \$1.75.
- \*Ward.—English Poets; Macmillan, latest edition, 1906; 4 vols., each \$1.
- \*Manly.—English Poetry; 1170-1892, Ginn, 1907; \$1.50.
- \*Lewis.—Principles of English Verse; Holt, 1906; \$1.25.

# VI. REPRINTS AND LITERARY CRITICISM.

- Bartlett.—Familiar Quotations; Little, Brown & Co., latest edition, 1907; \$3.
- [ Craik.—English Prose; Macmillan, 1893-'96; 5 vols., each \$1.10.
- Carpenter and Brewster.—Modern English Prose; Macmillan, 1904; \$1.10.
- Everyman's Library, a growing series of reprints, now numbering 340 vols.; Dutton; each 35 cents.
- The Arber Reprints.—Macmillan; each about 35 cents.
- \*Bates.—Talks on Teaching Literature; Houghton, 1906; \$1.30.
- Bates.—Talks on the Study of Literature; Houghton, 1897; \$1.50.
- Sherman.—Analytics of Literature; Ginn, 1893; \$1.25.
- Gayley and Scott.—Introduction to the Materials and Methods of Literary Criticism; Ginn, 1899; 2 vols., each \$1.25.
- \*Winchester.—Principles of Literary Criticism; Macmillan, 1900; \$1.50.
- [ Saintsbury.—History of Literary Criticism; Dodd, Mead & Co., 1901-'03; 3 vols., each \$3.50.
- Saintsbury.—Loci Critici (illustrative passages); Ginn, 1903; \$1.50.
- Bray.—History of English Critical Terms; Heath, 1898; \$1.
- Wylie.—Evolution of English Criticism; Ginn, 1894; \$1.
- Vaughan.—English Literary Criticism, and other volumes of the Warwick Library; Scribner's, 1896; \$1.50.
- McLaughlin.—Literary Criticism; Holt, 1893; \$1.
- Cooper.—Theories of Style; Macmillan, 1907; \$1.10.
- \*Woodberry.—Appreciation of Literature; Baker & Taylor, 1907; \$1.50.

# VII. WORKS ON THE DRAMA.

- \*Caffin.—Appreciation of the Drama; Baker & Taylor, 1908; \$1.50.
- Woodbridge.—The Drama; Allyn & Bacon, 1898; 80 cents.
- McEwan.—Freytag's Technique of the Drama; Scott, Foresman & Co., 1895; \$1.50.
- Thorndike.—Tragedy; Houghton, 1908; \$1.50.
- Matthews.—Development of the Drama; Scribner's, 1904; \$1.25.
- \*Price.—Technique of the Drama; Brentano, 1892; \$1.50.
- Hennequin.—Art of Play-writing; Houghton, 1890; \$1.25.
- Bates.—The English Religious Drama; Macmillan, 1893; \$1.50.

# VIII. WORKS ON THE NOVEL.

- Raleigh.—The English Novel; Scribner's, 1894; \$1.25.
- Stoddard.—Evolution of the English Novel; Macmillan, 1900; \$1.50.
- \*Whitcomb.—The Study of the Novel; Heath, 1905; \$1.25.

- \*Cross.—Development of the English Novel; Macmillan, 1899; \$1.50.
- \*Hamilton.—Materials and Methods of Fiction; Baker & Taylor, 1908; \$1.50.
- \*Horne.—The Technique of the Novel; Harper's, 1908; \$1.50.
- \*Perry.—The Study of Prose Fiction; Houghton, 1902; \$1.25.
- Dunlop.—History of Fiction, Bohn Library; Bell & Sons, 1888; 2 vols., each \$2.
- Baker.—Guide to Fiction; Macmillan, 1903; \$2.50.
- Dixson.—Guide to Fiction; Dodd, 1897; \$2.

#### IX. WORKS ON THE SHORT STORY.

- \*Barrett.—Short-story Writing; Baker & Taylor, 1900; \$1.50.
- \*Albright.—The Short Story; Macmillan, 1907; 90 cents.
- Matthews.—The Short Story; American Book Company, 1907; \$1.
- Matthews.—The Philosophy of the Short Story; Longmans, 1901; 50 cents.
- Canby.—Book of the Short Story; Appleton, 1904; \$1.10.
- Mabie.—Stories New and Old, American and English; Macmillan, 1908; \$1.50.
- Baldwin.—American Short Stories; Longmans, 1904; \$1.40.
- Cody.—World's Greatest Short Stories; McClurg, 1902; \$1.

#### X. REFERENCE WORKS ON LITERATURE.

- \*Green.—Short History of the English People; American Book Company, 1896; \$1.20.
- Gosse, editor.—Literatures of the World Series; Appleton; each vol., about \$1.50.
- Saintsbury, editor.—Periods of European Literature; Scribner's; a series, each vol., \$1.50.
- Walker.—Three Centuries of Scottish Literature; Macmillan, 1893; 2 vols., each \$2.
- Millar.—Literary History of Scotland; Scribner's, 1903; \$4.
- Brand and Ellis.—Popular Antiquities; Bohn Library, Bell & Sons; 3 vols., each \$1.50.
- Strutt.—Sports and Pastimes of the English People; London, Chatto & Windus, 1898; about \$1.
- Hudson.—History of Journalism in the United States; Harper's, 1873; \$5.
- Saintsbury.—Short History of French Literature; Oxford University Press, 1882; \$2.60.
- Gostwick and Harrison.—Outlines of German Literature; Holt, 1873; \$2.
- Hosmer.—Short History of German Literature; Scribner's, 1891; \$2.

- \*Botta.—Handbook of Universal Literature; Houghton, latest edition, 1902; \$2.
- \*Ploetz.—Epitome of Universal History; Houghton, latest edition, 1905; \$2.
- \*Loliee.—History of Comparative Literature (trans. by Power); London, Hodder & Stoughton, 1906; about \$2.

### XI. ENGLISH COMPOSITION.

- Baldwin.—College Manual of Rhetoric; Longmans, 1903; \$1.35.
- Cairns.—Forms of Discourse; Ginn, 1896; \$1.15.
- Tompkins.—Science of Discourse; Ginn, 1897; \$1.
- \*Wendell.—English Composition; Scribner's, 1891; \$1.50.
- \*Gardiner.—Forms of Prose Literature; Scribner's, 1900; \$1.50.
- \*Bates.—Talks on Writing English; first series, Houghton, 1896; \$1.50.
- \*Bates.—Talks on Writing English; second series, Houghton, 1901; \$1.30.
- \*Scott and Denney.—Paragraph Writing; Allyn & Bacon, 1893; 80 cents.
- Thomas and Howe.—Composition and Rhetoric; Longmans, 1908; \$1.20.
- Carson.—Handbook of English Composition; World Publishing Company, 1907; 65 cents.
- \*Woolley.—Handbook of Composition; Heath, 1908; 80 cents.

### XII. DEBATE AND ARGUMENT.

- \*Alden.—Art of Debate; Holt, 1900; \$1.
- Perry.—Argumentation; American Book Company, 1906; \$1.
- \*Foster.—Argumentation and Debating; Houghton, 1907; \$1.25.
- Laycock and Scales.—Argumentation and Debate; Macmillan, 1904; \$1.10.
- Perry.—Exposition; American Book Company, 1908; \$1.
- Mitchill and Carpenter.—Exposition in Class-room Practice; Macmillan, 1906; 70 cents.
- Brookings and Ringwalt.—Briefs for Debate; Longmans, 1896; \$2.25.

### XIII. PUNCTUATION.

- \*Perry.—Punctuation Primer; American Book Company, 1908; 30 cents.
- Bigelow.—Handbook of Punctuation; Lothrop, Lee & Shepard, 1893; 50 cents.
- \*Teall.—Punctuation; Appleton, 1897; \$1.
- DeVinne.—Correct Composition; Century Publishing Company, 1902; \$2.

## XIV. REFERENCE WORKS IN LANGUAGE.

- \*Fernald.—Synonyms, Antonyms, and Prepositions; Funk & Wagnalls, 1897; \$1.50.
- \*Fernald.—The Connectives of English Speech; Funk & Wagnalls, 1903; \$1.50.
- Roget.—Thesaurus of English Words and Phrases; Lippincott, 1856; \$1.50.
- Soule.—Dictionary of English Synonyms (ed., Howison); Little, Brown & Co., 1894; \$2.
- \*Phyfe.—Twelve Thousand Words Often Mispronounced; Putnam's, latest edition, 1908; \$1.25.
- Mackey.—Pronunciation of 10,000 Proper Names; Dodd, Mead & Co., 1901; \$1.
- \*Lounsbury.—Standard of Pronunciation in English; Harper's, 1903; \$1.20.
- Vizetelly.—Desk-book of Errors in English; Funk & Wagnalls, 1906; 75 cents.
- \*Skeat.—Etymological Dictionary of the English Language; Oxford University Press, third edition, 1908; \$11.
- March.—Thesaurus Dictionary; Historical Publishing Company; 1902-'03; \$15.
- Earle.—English Prose; Putnam's, 1890; \$4.
- \*Greenough and Kittredge.—Words and Their Ways in English Speech; Macmillan, 1901; \$1.10.
- \*The King's English; Oxford University Press; second edition, 1906; \$1.75.
- Hartog.—The Writing of English; Oxford University Press, 1907; 60 cents.
- Payne.—English in American Universities; Heath, 1895; 75 cents.

## XV. GRAMMAR AND LANGUAGE HISTORY.

- \*Leonard.—Grammar and Its Reasons; A. S. Barnes, 1908; \$1.50.
- West.—English Grammar; Macmillan, 1894; 60 cents.
- Nesfield.—English Grammar, Past and Present; Macmillan, 1898; \$1.10.
- Sweet.—New English Grammar, Part I; Oxford University Press, 1892; \$2.60.
- Sweet.—New English Grammar, Part II; Oxford University Press; 1898; 90 cents.
- Morris.—Historical Outlines of English Accidence; revised by Kellner & Bradley, Macmillan, 1895; \$1.40.
- Kellner.—Historical Outlines of English Syntax; Macmillan, 1892, \$1.40.

- Earle.—Philology of the English Tongue; fifth edition, Oxford University Press; \$2.
- \*Lounsbury.—History of the English Language; Holt, 1894; \$1.12.
- \*Emerson.—History of the English Language; Macmillan, 1894; \$1.25.
- Champney.—History of the English Language; Macmillan, 1893; \$1.25.
- Toller.—History of the English Language; Macmillan, 1900; \$1.10.
- Abbott.—Shakespearian Grammar; Macmillan, 1869; \$1.50.
- Skeat.—Principles of English Etymology, first series; Oxford University Press, second edition, 1892; \$2.25.
- Skeat.—Principles of English Etymology, second series; Oxford University Press, 1891; \$2.50.
- Sweet.—Primer of Spoken English; third edition, Oxford University Press; 90 cents.
- Sweet.—The Sounds of English; Oxford University Press, 1908; 60 cents.
- Soames.—Introduction to the Study of Phonetics (ed., Vietor); 1889, London, Swan, Sonnenschein & Co.; about \$1.75.
- \*Jespersen.—Progress in Language; Macmillan, 1894; \$1.90.
- \*Jespersen.—Growth and Structure of the English Language; Lemcke & Buechner, 1906; \$1.
- \*Clodd.—Story of the Alphabet; Appleton, 1900; 35 cents; Sweet.—History of Language; Macmillan, 1900; \$1.
- Oertel.—Lectures on the Study of English; Scribner's, 1902; \$3.
- \*Bradley.—The Making of English; Macmillan, 1904; \$1.
- \*Wyld.—The Growth of English; Dutton, 1907; \$1.

\* Books of special importance in the preceding list are marked with an asterisk and teachers should consider these first when they are limited to a small number.

For high-school teachers desiring fuller explanations of the high-school English course than are given in the University catalogue and the State Manual, the University Handbook on the Teaching of English, the supply of which was temporarily exhausted, may now be obtained of the publishers, Scott, Foresman & Co., for twenty-five cents, postpaid.

## HISTORY.

Books for high-school libraries recommended by the Department of History in the University of Kansas:

### BOOKS USEFUL FOR THE TEACHER.

- Bourne, H. E.—The Teaching of History and Civics; Longmans; \$1.50.

Historical Sources in Schools; Macmillan; 60 cents.

Historical Syllabus for Secondary Schools; Heath; 60 cents.

#### ATLASES.

Dow, E.—Atlas of European History; Holt & Co.; \$1.50.

Gardner, S. R.—Atlas of English History; Longmans; \$1.50.

Hart, A. B.—Epoch Maps; Longmans; 50 cents.

Johnson.—Half-Crown Atlas; Scribner's; \$1.

Reich, E.—A New Atlas of English History; Macmillan; \$3.25.

Outline maps for practice in map-drawing may be had from Atkinson, Mentzer, Grovner, Chicago; Heath & Co., Boston; McKimley Company, Philadelphia; Rand, McNally & Co., Chicago.

Ginn & Co. publish an Outline Atlas of American History prepared by Prof. F. H. Hodder, of the University.

The department will be glad to advise with teachers in the selection of books from these lists.

#### ANCIENT HISTORY.

Bullfinch, I.—The Age of Fable; Lee & Shepard; \$3.

Bury, J. B.—The Student's Roman Empire; American Book Company, \$1.50.

Church, A.—Roman Life in the Days of Cicero; Macmillan; 50 cents.

Firth, J. B.—Constantine the Great; Putnam's; \$1.50.

Fowler, W. W.—Cæsar; Putnam's; \$1.50.

Froude, J. A.—Cæsar, a Sketch; Scribner's; \$1.50.

Gulick, C. B.—The Life of the Ancient Greeks; Appleton; \$1.40.

Herodotus.—History (ed. by Grant); 2 vols., Scribner's; \$3.50.

Homer.—Iliad (trans. by Lang, Leaf and Myers); Macmillan; 80 cents.

How and Leigh.—Rome to the Death of Cæsar; Longmans; \$2.00.

Jebb, R. C.—Greek Literature; American Book Company; 35 cents.

Munro, D. C.—Source Book of Roman History; Heath; \$1.50.

Plutarch.—Lives (Clough ed.); Little; \$2.00.

Preston and Dodge.—Private Life of the Romans; Leach; \$1.

Sayce, A. H.—The Ancient Empire of the East; Scribner's; \$1.20.

Shuckburgh, E. S.—Augustus Cæsar; Putnam's; \$1.50.

Tarbell, F. B.—History of Greek Art; Macmillan; \$1.

Tozer, H. F.—Classical Geography; American Book Company; 35 cents.

Wheeler, B. I.—Alexander the Great; Putnam's; \$1.50.

*Additional Books.*

- Abbott, E.—History of Greece; 3 vols., Rivington; \$7.75.  
 Abbott, E.—Pericles; Putnam's; \$1.50.  
 Abbott, F. F.—Roman Political Institutions; Ginn; \$1.50.  
 Aristotle.—On the Constitution of Athens; Macmillan; \$1.10.  
 Arnold.—Roman Provincial Administration; Macmillan; \$1.50.  
 Aurelius, M.—Thoughts; Macmillan; \$1.  
 Beesly, A. H.—The Gracchi, Marius and Sulla; Longmans; \$1.  
 Blümner, H.—Home Life of the Greeks; Cassell; \$2.50.  
 Botsford.—The Story of Rome as Greeks and Romans Tell It; Macmillan; 90 cents.  
 Capes, W. W.—The Early Empire; Longmans; \$1.  
 Capes, W. W.—Age of the Antonines; Longmans; \$1.  
 Church, A. J.—Carthage; Putnam's; \$1.50.  
 Dill, S.—Roman Society in the Last Century of the Roman Empire; Macmillan; \$2.  
 Dill, S.—Roman Society from Nero to Marcus Aurelius; Macmillan; \$2.  
 Dodge, T. A.—Alexander; Houghton; \$5.  
 Fisher, G. P.—Beginnings of Christianity; Scribner's; \$2.50.  
 Fling, F. M.—Greek and Roman Civilization; Ainsworth; 60 cents.  
 Fling, F. M.—Source Book of Greek History; Heath; \$1.  
 Fowler, W. W.—The City State of the Greeks and Romans; Macmillan; \$1.  
 Gardner, A.—Julian; Putnam's; \$1.50.  
 Gibbon, E.—Decline and Fall of the Roman Empire; 7 vols., Macmillan; \$14.  
 Goodspeed, G. S.—History of the Babylonians and Assyrians; Scribner's; \$1.25.  
 Greenridge, A. H. J.—Greek Constitutional History; Macmillan; \$1.25.  
 Holm, A.—History of Greece; 4 vols., Macmillan; \$10.  
 Keary, C. F.—The Dawn of History; Scribner's; \$1.25.  
 Lanciani, R.—Ruins and Excavations of Ancient Rome; Houghton; \$4.  
 Mahaffy, J. P.—Old Greek Life; American Book Company; 35 cents.  
 Mommsen, T.—History of Rome; 5 vols., Scribner's; \$10.  
 Morris, W. O.—Hannibal; Putnam's; \$1.50.  
 Pellison, M.—Roman Life in Pliny's Time; Jacobs; \$1.  
 Rogers, R. W.—Babylonia and Assyria; 2 vols., Eaton; \$3.  
 Schuchhardt, C.—Schliemann's Excavations; Macmillan; \$4.  
 Tacitus.—History, Books 1-5; Macmillan; \$1.90.  
 Thomas, E.—Roman Life Under the Cæsars; Putnam's; \$1.75.

Thucydides.—History (Jowett; trans. ed. by Peabody); Lothrop; \$2.  
Tsountas and Manatt.—Mycenæan Age; Houghton; \$6.

### MEDIÆVAL AND MODERN HISTORY.

- Adams, G. B.—Civilization During the Middle Ages; Scribner's; \$2.50.  
Adams, G. B.—Growth of the French Nation.  
Archer and Kingsford.—The Crusades; Putnam's; \$1.50.  
Barry, W.—Papal Monarchy; Putnam's; \$1.50.  
Besant, W.—Coligny; American Book Company; 30 cents.  
Brown, H. F.—The Venetian Republic; Macmillan; 40 cents.  
Bryce, J.—The Holy Roman Empire; Macmillan; \$2.  
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Fairbanks.—Physiography.  
Brigham.—Laboratory Manual Physiography; Appleton.  
Thrafton.—Laboratory Manual Physiography; Ginn & Co.  
Topographic Maps: United States Geological Survey, Washington, D. C.  
Mississippi River Maps: Mississippi River Commission.  
Coast Charts: United States Coast and Geodetic Survey, Washington, D. C.  
Geological Folios: United States Geological Survey.

## MATHEMATICS.

- Baker.—Elementary Geometry; Ginn & Co.  
Nichol.—Introductory Geometry; Longmans.  
Hornbrook.—Concrete Geometry; American Book Company.  
Dodd & Chase.—Elements of Algebra and Geometry; Kimberly Publishing Company.  
Campbell.—Observational Geometry; American Book Company.  
Hailmann.—Constructive Form of Work; P. C. Burchard & Co.

### REFERENCE BOOKS ON AGRICULTURE.

List of publications for free distribution, Circular No. 2, United States Department of Agriculture.

Agricultural Education, No. 2, 1907; United States Bureau of Education.

Burbank.—The Training of the Human Plant.

Harwood.—The New Agriculture.

Goff and Mayne.—Principles of Agriculture.

Hemenway.—How to Make School Gardens.

#### HOME ECONOMICS.

Bashore.—Outlines of Rural Hygiene.

Bevier and Usher.—Home Economic Movement.

Checkley.—Natural Method of Physical Training.

Green, S. B.—Amateur Fruit Growing.

Green, S. B.—Vegetable Gardening.

Parsons.—How to Plan the Home Grounds.

Prudden.—Story of Bacteria.

Richards.—First Lessons in Food and Diet.

Richards and Talbot.—Home Sanitation.

Richards and Woodman.—Air, Water, and Food.

Wheeler.—Principles of Home Decoration.

Shepperd.—Household Science.

Plair.—Exercises in Hand-sewing.

### REFERENCE BOOKS ON MANUAL TRAINING.

Woodward.—The Manual Training School.

Sickels.—Exercises in Wood-working.

Hildreth.—Clay-modeling in the Schoolroom.

Design :

Haney, J. P.—Classroom Practice in Design.

Bachelor.—Principles of Design.

Wood-working :

Wheeler.—Wood-working for Beginners.

Goss.—Bench-work in Wood.

Park, J. C.—Educational Wood-working for School and Home.

Rowe.—Practical Wood-carving.

Furniture :

Crawshaw.—Problems in Furniture-making.

Metal-working :

Rose.—Copper-work.

**Benches :**

Grand Rapids Hand-screw Company, 916 Jefferson avenue,  
Grand Rapids, Mich.

Columbia School Supply Company, Indianapolis, Ind.

**Tools and Supplies :**

Orr & Lockett Hardware Company, 71-73 Randolph street, Chi-  
cago.

Chas. A. Strelinger Company, box G-35, Detroit, Mich.

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**SOME BOOKS RECENTLY PUBLISHED OF SPECIAL VALUE  
TO TEACHERS.**

Henderson.—Education and the Larger Life; Houghton, Mifflin &  
Co.

De Garmo.—Principles of Secondary Education, the Studies; Mac-  
millan.

Horne.—Psychological Principles of Education; Macmillan.

Dinsmore.—Teaching a District School; American Book Company.

Chancellor.—Motives, Ideals and Values in Education; Macmillan.

Tyler.—Growth and Education; Houghton, Mifflin & Co.

De Garmo.—Principles of Secondary Education, Processes of In-  
struction; Macmillan.

Davidson.—Human Body and Health; American Book Company.

Burnet.—Laboratory Manual of Zoölogy; American Book Company.

**LABORATORY NOTE-BOOKS.**

Glencoe loose-leaf note-book and cover; Atkinson, Mentzer & Gro-  
ver, Chicago.

National chemistry note-book; L. E. Knott Apparatus Company,  
Boston, Mass.

The Harcourt binders; L. E. Knott Apparatus Company, Boston.

Physical apparatus; C. H. Stoelting Company, Chicago; Central  
Scientific Company, Chicago; Wm. Gaertner Company, Chicago.









42h

Vol. XL

No. 4.

BULLETIN OF THE  
UNIVERSITY OF KANSAS.

Published Bimonthly by the University of Kansas, Lawrence.

High-school Manual,  
No. VII.

UNIVERSITY OF ILLINOIS



PRESIDENT'S OFFICE

JUN 28 1910

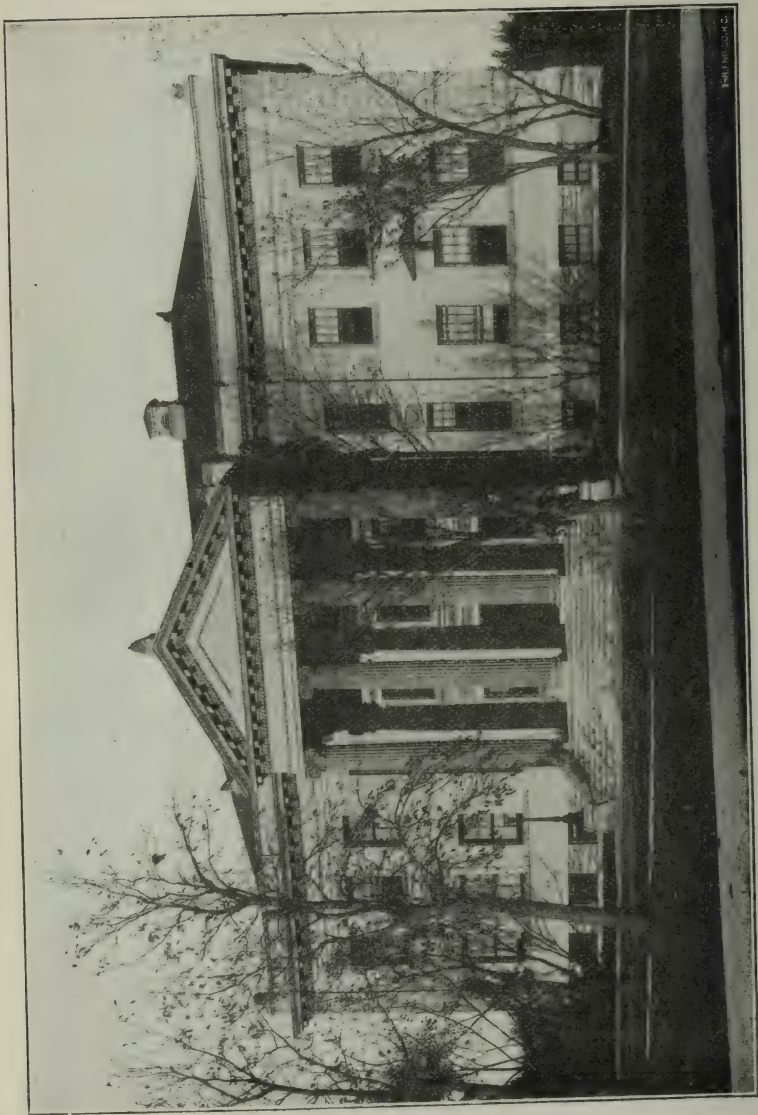
January, 1910.

Lawrence, Kansas.

ENTERED AT THE POST OFFICE AS SECOND-CLASS MATTER.







GREEN HALL. (K. U. Law School.)

The University of Kansas,  
Lawrence.

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# High-School Manual,

## No. VII.

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UNIVERSITY OF ILLINOIS



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PRESIDENT'S OFFICE

January, 1910.

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STATE PRINTING OFFICE,  
TOPEKA, 1910.

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## Second Annual Report.

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TO THE HONORABLE BOARD OF REGENTS, UNIVERSITY OF KANSAS :

I have the honor of submitting herewith my second annual report on the visitation of high schools.

The policy of the University in its relation to the high schools seeks to establish a natural and practical arrangement by which it can render the greatest service to secondary education. This service may issue in different forms, but high-school visitation affords one of the chief means for securing information and maintaining a helpful relationship.

The plan in vogue at the University for admitting students to the Freshman class without examination makes necessary close supervision of preparatory work in high schools. The University must recognize the limitations of the secondary schools, and instructors in secondary schools must fully appreciate the character of scholarship necessary to enter the field of college work. This mutual understanding is the basis of coöperation, and makes the articulation of college and school curricula easy and natural.

The report submitted here is intended to give a brief statement in regard to: (a) Requirements for College entrance; (b) methods of accrediting schools, together with the classification of the same; (c) the scope of secondary education in the state, the expense and relative cost of various departments; (d) the status of the Barnes law high school; (e) growth and work of county high schools; (f) suggestions for improvements.

The conditions upon which a high school may be accredited are practically the same as stated in my report for last year. By action of the College faculty the list of subjects prescribed for entrance credit was enlarged by the addition of group VII, designated as vocational subjects, from which any student is permitted to offer a maximum of one credit. The other groups from which College entrance credits may be selected remain the same, with the exception of one-half credit which is now offered for civics, economics and physiography.

A school may become affiliated with the University by making application to the High-school Visitor, who sends a blank for accredited relations to the principal, which, when properly filled out, is returned to the University and filed for future reference. If the showing made upon this report warrants further investigation the school is inspected.

In determining the efficiency of a school the following conditions are considered:

1. The instructors should be well qualified, and, as far as practicable, especially trained for educational work.

2. No instructor should be required to carry more than six recitations per day.

3. Superintendents and principals should be given sufficient time to visit the various grades or departments for the purpose of supervision.

4. There should be at least three teachers devoting full time to grade work, and not less than two teachers in the high school.

5. The school year should be at least thirty-five weeks in length.

6. The laboratories should be supplied with apparatus, tables, sink and other appliances necessary to enable the student to perform the required experiments.

7. The laboratory period should be double the length of the recitation period.

8. The library should consist of carefully selected books of reference and supplementary reading upon the various lines of high-school work. This library should be conveniently placed, and should be indexed so that the student will lose as little time as possible in finding the literature upon any subject.

While we do not expect a school to be perfect in all of these particulars, they serve fairly well in estimating the true merits of school work in any particular place.

In addition to these requirements, each school is expected to offer as a part of its course of study a line of work which will meet the requirements for entrance to the Freshman class of the College of Liberal Arts and Sciences. Any graduate of a high school, before he can gain unconditional admission to the University, would be obliged to offer fifteen units, a unit being one subject pursued for thirty-five weeks, five recitations per week, each forty minutes in length. These units should be distributed as follows: Three units of English, two and one-half units of mathematics, three units of either German or Latin, one unit of history, one unit of physical science, and one unit of biological science; the remaining three and one-half units may be elected by the student from any of the groups. A student who for any reason cannot offer more than thirteen units, but who can fulfill the other conditions with reference to languages and mathematics, is admitted to the Freshman class on condition. At the present time there are seven groups of subjects prescribed for entrance to the University, arranged as follows:

TABLE I.

GROUP I, English.	English, four units.	Three units are required.
GROUP II, Mathematics.	Elementary algebra, one and one-half units. Plane geometry, one unit. Solid geometry, one-half unit. Plane trigonometry, one-half unit. Advanced algebra, one-half unit.	The elementary algebra and plane geometry are required.
GROUP III, Foreign Languages.	Latin, four units. Greek, three units. German, three units. French, three units.	Of these, three units are required, which must be, first, in Latin, or, second, in German.

<b>GROUP IV, Physical Sciences.</b>	Physical geography, one unit, or one-half unit. Physics, one unit. Chemistry, one unit.	One unit is required.
<b>GROUP V, Biological Sciences.</b>	Botany, one unit. Zoölogy, one unit. Physiology, one unit.	One unit is required.
<b>GROUP VI, History.</b>	Greek and Roman, one unit. Mediæval and modern, one unit. English, one unit. American, one unit. Economics, one unit, or one-half unit. Civics, one-half unit.	One unit is required.
<b>GROUP VII, Vocational Subjects.</b>	Woodwork, one unit. Drawing, one unit. Domestic Art, one-half unit. Domestic Science, one-half unit. Agriculture, one-half unit. Bookkeeping, one-half unit. Commercial Law, one-half unit. Commercial Geography, one-half unit. Psychology, one-half unit. Methods and Management, one-half unit.	One unit may be offered.

When any school can satisfy the above requirements it is recognized as an accredited school and its graduates are given entrance credit upon the statement of the principal or superintendent certifying that the above conditions and requirements have been fulfilled.

In classifying the accredited schools of the state one is compelled to follow arbitrary rules to a certain extent. It is not always possible to determine the efficiency of a school by these rules; the character of scholarship which is developed in a school, and the readiness with which high-school graduates take up the more advanced work in the colleges are more satisfactory tests of the efficiency of school work than can be gained from any formal visit or system of inspection. There are certain conditions, however, that must prevail before any very worthy standard of teaching can be reached.

Giving careful consideration to all of these conditions, the high schools of the state in their relation to the University naturally fall into three classes.

Class I contains all of the schools that fully meet the requirements for entrance to the University. These schools number 140, and unless some radical change takes place which becomes known to the Visitor, these schools are not visited oftener than once in two years. This number exceeds the number fully accredited last year by only seven schools. All of the schools listed in this class continue for a term of thirty-six weeks; in only a very few cases is any teacher required to carry more than six recitations per day, and in every case the equipment and other conditions are favorable for first-class high-school work.

Class II contains ninety-two high schools. All schools listed in this class offer a four-year course of study. In the majority of them, however, only two teachers are employed who devote full time to high-school work. This often makes it necessary for a teacher to carry more than six recitations per day. Each teacher also is often required to carry subjects in more than two lines of work, which makes it impossible to give the most efficient instruction. As a rule these schools are given credit for all prescribed work which is offered by graduates in fulfillment of entrance requirements. The University reserves the right, however, to refuse credit in case it is known that a subject has not been properly taught or that the laboratory work has been neglected. It is often difficult to secure well-qualified teachers in these smaller schools. It also happens sometimes that teachers are employed to teach the languages who are also required to teach mathematics or a science when such teacher has made no special preparation for these branches. Full entrance credit would not be allowed a graduate for a course taken under such conditions. A school in this class is accredited by subject and not as a whole.

Class III numbers thirty schools. In last year's report eighteen schools were placed in this class, but all were advanced to the second class except seven, namely, Almena, Burr Oak, Derby, Lucas, Sylvan Grove, Williamsburg, and Barnard. These schools offer either two, three, or four years of work, and are recognized only as working towards accredited relations. All so listed are offering instruction in a course of study planned by the principal and approved by the High-school Visitor, but they have not yet been pursuing such course long enough to reach an accredited basis. Many schools in this class will be accredited for the year 1910-'11; that is, the program at the opening of school in September, 1910, will contain classes in all of the regular four years of high-school work and two or more teachers will be employed to conduct the classes. The visitor has examined only a few of the schools listed in the third class. The intention is to inspect all of them during the current year. Applications for accreditation are on file and all information in regard to equipment and other conditions is at hand. The schools which were listed in the third class for the year 1908-'09 and which have been advanced to accredited relations for the present year are: Basehor, Bunkerhill, Glasco, Havensville, Liberal, Norwich, Redfield, Scott County, St. Marys, White Cloud, Wilson.

# Affiliated Schools Classified.

## CLASS I.

Schools found in this list are fully accredited.

NAME OF SCHOOL.	Superintendent.	Principal.
Abilene.....	W. A. Stacey, B. S.....	Frank E. Tyler, A. B.
Alma.....	E. B. Gift, A. B.....	Victor E. Chesky, A. B.
Altoona.....	H. C. Duckworth.....	Grace Graham, A. B.
Anthony.....	B. E. Lewis, A. M.....	G. C. Bailey, A. B.
Argentine.....	H. P. Butcher, A. B.....	Minnie J. Oliverson, A. B.
Arkansas City.....	John F. Bender, A. B.....	E. A. Robinson, A. B.
Ashland.....	O. O. Smith, A. B.....	L. M. Simes, A. B.
Atchison.....	Nathan T. Veatch.....	W. H. Livers, A. B.
Atchison County,		
Effingham.....		Edgar H. McMath, A. B.
Augusta.....	Charles W. Pratt.....	Stella Haines.
Axtell.....	S. L. Soper, A. B.....	E. C. Farrar.
Belleville.....	George W. Kleihege, B. S.....	L. M. Metzler.
Beloit.....	A. P. Gregory, B. S.....	T. P. Downs.
Bethel Academy, Newton,	C. M. Wedel, M. A.....	E. R. Riesen, A. B.
Blue Rapids.....	C. C. Brown, M. A.....	E. M. Bartholow, A. B.
Bonner Springs.....	Herman Pfeifer, A. B.....	Mattie Thomas, A. B.
Bronson.....	A. E. Lunceford.	
Burden.....	N. H. Bartlett, B. S.....	Grace B. Hornaday, A. B.
Burlingame.....	C. A. Deardorff, M. E.....	Nellie C. Terrill, A. B.
Burlington.....	Inez M. Chapman, A. B.....	Bess M. Kilbourn, A. B.
Burrton.....	H. J. Davis.....	Helen Kinzer, A. B.
Caldwell.....	D. C. Porter, A. B.....	Lucia Burnham, A. B.
Caney.....	R. Rankin.....	F. R. Aldrich, A. B.
Chanute.....	F. L. Pinet.....	J. A. Cannan.
Chase County,		
Cottonwood Falls.....		A. M. Thoroman, A. B.
Chelsea (Kansas City).....		W. H. Fasold.
Cheney.....		C. A. Mahin.
Cherokee County,		
Columbus.....		M. L. Catlett.
Cherryvale.....	H. D. Ramsey.....	N. A. Baker.
Clay County,		
Clay Center.....		E. B. Allbaugh.
Clyde.....	Clinton Wright, A. B.....	Grace McKenney, Ph. B.
Coffeyville.....	Wm. M. Sinclair.....	R. G. Kennedy.
Concordia.....	A. F. Senter, B. S.....	Benjamin S. Hill, A. B.
Council Grove.....	S. D. Dice, A. B.....	Harry M. Brown, A. B.
Crawford County,		
Cherokee.....		W. S. Pate.
Decatur County,		
Oberlin.....		A. I. Clow, A. B.
Dickinson County,		
Chapman.....		J. P. Perrill, B. P.
Dodge City.....	S. V. Mallory, B. S.....	J. E. Coe, A. B.
Douglas.....	J. E. Cook.	
El Dorado.....	B. F. Martin.....	John B. Heffelfinger, A. B.
Ellis.....	Frank Drake, jr., LL. B.....	Clara Carpenter, A. B.
Ellsworth.....	O. J. Silverwood, A. B.....	C. O. Getty, A. B.
Emporia.....	L. A. Lowther, A. B.....	Chas. A. Wagner, A. B.
Eskridge.....	G. A. Brown.....	J. E. Crawford, LL. B.
Eureka.....	W. S. Robb, B. S.....	F. H. Gillett, A. B.
Fort Scott.....	J. B. Stokesberry, A. B.....	J. F. Hughes, A. B.
Frankfort.....	M. G. Kirkpatrick.....	Mary K. Phenice, A. B.
Fredonia.....	C. F. Daugherty, B. Ped.....	W. I. Matthews.
Galena.....	L. A. Guthridge.....	R. R. Cook, A. B.
Garden City.....	G. E. Brown.....	E. J. Dumond.

## CLASS I—CONTINUED.

NAME OF SCHOOL.	Superintendent.	Principal.
Garnett.....	C. H. Oman, A. B.....	George R. Hiatt, A. B.
Gas City.....	Thomas E. Osborn.....	Sophia Shawver.
Girard.....	H. W. Shideler, A. B.....	Mabel Winger, A. B.
Great Bend.....	D. F. Shirk, A. B.....	O. C. Hull, A. B.
Greenleaf.....	L. P. Wharton, B. S.....	Christina Nelson, A. B.
Halstead.....	B. P. Young, B. S.....	W. O. Gibbon, Ph. B.
Harper.....	A. L. Stickel, M. A.....	E. L. Fulton, A. B.
Hartford.....	Anna H. Brogan.	
Hays.....	Lee R. Light.....	Annie P. Hopkins.
Herington.....	R. J. McAllister, B. S.....	Francis Robb, A. B.
Hiawatha.....	George G. Pinney, A. B.....	Raymond G. Taylor, A. B.
Hoisington.....	T. M. Keegan, A. B.....	Virginia E. Coleman, A. B.
Holton.....	H. H. Van Fleet, A. B.....	H. W. Gowans, B. S.
Howard.....	H. I. French.....	Anna S. Lees.
Humboldt.....	A. I. Decker, B. B.....	W. L. Goad.
Hutchinson.....	J. O. Hall, A. B.....	S. L. Palmer, B. S.
Iola.....	L. W. Mayberry, A. B.....	W. H. Carothers, A. B.
Junction City.....	W. S. Heusner, M. A.....	J. W. Shideler, Ph. B.
Kansas City.....	M. E. Pearson, M. A.....	H. L. Miller, A. B.
Kingman.....	Alvin W. Ault, A. B.....	Chas. A. Hall, A. B.
Kinsley.....	D. A. Baugher.	
Kiowa.....	Ira Stout.....	Katherine Stocker, A. B.
Labette County, Altamont.....		W. M. Kiser, A. B.
La Harpe.....	F. M. Hyames.....	H. T. Steeper, A. B.
Larned.....	R. V. Phinney.....	J. L. Mickey.
Lawrence.....	F. P. Smith, M. A.....	F. H. Olney, A. B.
Leavenworth.....	G. W. Kendrick.....	Belle Wittrock.
Lincoln.....	R. E. Long.....	Mary B. Nelson.
Lindsborg.....	I. C. Meyer.....	Esther Sundstrom, A. B.
Little River.....	C. A. Murphy, B. S.....	Blanche Pilcher, A. B.
Lyons.....	T. A. Edgerton.....	Ella M. Nash, A. B.
Mankato.....	F. W. Simmonds, M. S.....	Maude Hulse, B. Pd.
Marion.....	C. E. St. John.....	George E. Jones, A. B.
Marysville.....	R. L. Parker, M. A.....	A. D. Catlin, A. B.
McPherson.....	Chas. W. Kline, A. B.....	A. B. Cope, M. A.
Medicine Lodge.....	D. W. Major, M. A.....	Annie Bell, A. B.
Minneapolis.....	C. O. Smith.....	G. R. Duer, M. A.
Montgomery County, Independence.....		S. M. Nees, B. S.
Moran.....	B. A. Green, A. B.....	Hattie Maupin, A. B.
Neodesha.....	J. M. Steffen.....	Bessie G. Ryan.
Newton.....	L. J. Hall.....	S. U. Pett.
Norton County, Norton.....		H. H. Gerardy.
Oakley.....	J. S. Carson, M. A.....	F. W. Erwin.
Olathe.....	C. M. Ware.....	A. G. Tritt, A. B.
Onaga.....	F. E. Robinson, B. S.....	Vesta Moore.
Osage City.....	Lambert Eidson, A. B.....	J. S. Magunson, A. B.
Osawatimie.....	Floyd B. Lee.....	H. B. Amyx.
Osborne.....	R. K. Farrar, B. S.....	
Oskaloosa.....	A. S. Hiatt, A. B.....	Olive Collins, A. B.
Ottawa.....	A. L. Bell, A. B.....	R. E. Gowans, A. B.
Paola.....	F. K. Ferguson, B. S.....	E. L. Thompson, A. B.
Parsons.....	J. A. Higdon, M. A.....	Louise M. Schaub.
Peabody.....	J. W. Roberts, A. B.....	Elida Hanson.
Pittsburg.....	A. H. Bushey, A. B.....	Robert E. Hartsock, B. S.
Plainville.....	F. Marks.....	Belle Lunden, B. S.
Pleasanton.....	J. Van Arsdale, A. B.....	Ruby Hosford, A. B.
Pratt.....		E. H. Ellsworth, M. A.
Rawlins County, Atwood.....		C. W. McCormick, A. B.
Reno County, Nickerson.....		E. B. Smith, M. A.
Rosedale.....	George E. Rose, M. S.....	Ava Douthart, A. B.
Russell.....	N. U. Spangler.....	E. C. Neuschwanger.

## CLASS I—CONCLUDED.

NAME OF SCHOOL.	Superintendent.	Principal.
Sabetha.....	George T. Beach, M. A.....	Guy O'Roke, M. Accts.
St. John.....	Charles M. Hilleary.....	Joseph H. Byers, A. B.
Salina.....	John Lofty, A. B.....	E. W. Pettibone, A. B.
Sedan.....	Howard J. Hanna.....	Ethel M. Childers.
Sedgwick.....	Robert N. Halbert, Ph. B....	Muriel E. Finn, A. B.
Seneca.....	R. G. Mueller, A. B.....	Merle C. Prunty, A. B.
Sharon Springs.....	A. D. Haas.....	L. W. Herman.
Sheridan County, Hoxie.....		H. C. Jent.
Sherman County, Goodland.....		E. E. Mitchell, Ph. B.
Smith Center.....	T. H. Hooper, A. B.....	Etta M. Price, A. B.
Solomon.....	W. O. Steen.....	Irene Pemberton, A. B.
Southern Kansas Acad., Eureka.....		Morton M. Newcomb, A. B.
Stafford.....	E. C. Kittell, B. Pd.....	Henrietta Hall.
Sterling.....	George L. Seeley, A. B.....	Jeannette M. Inches, Ph. B.
St. Mary's Academy, Leavenworth.....		Sister M. Berchmans.
Stockton.....	Mother M. Olive.....	Inez Ledyard, A. B.
Sumner (Kansas City).....	R. Bullimore.....	J. M. Marquess, A. B.
Sumner County, Wellington.....		W. C. McCroskey, A. B.
Thomas County, Colby.....		J. E. Chamberlain.
Tonganoxie.....	Wm. G. Gambill.....	Nannie L. Busenbark.
Topeka.....	L. D. Whitemore, M. A.....	A. J. Stout.
Trego County, Wa Keeney.....		J. H. Niesley, A. B.
Troy.....	C. S. Hambleton.....	Elizabeth Turkleson.
Valley Falls.....	Harry McGuire.....	Maud Myers.
Washington.....	J. W. Murphy, A. B.....	R. H. McWilliams, A. B.
Waterville.....	G. H. Baird.....	Clara Speckmann.
Wichita.....	R. F. Knight, B. Ph.....	I. M. Allen, LL. B.
Winfield.....	J. W. Spindler, M. A.....	J. W. Gowans, A. B.
Yates Center.....	J. H. Wishard.....	Grace Melton, B. P.

## CLASS II.

Schools listed in class II offer an approved four-year course of study but may fall short of full preparation by not more than two units:

NAME OF SCHOOL.	Superintendent.	Principal.
Alden.....	Louis Ringwalt.....	Estelle Dougherty, A. B.
Alta Vista.....	L. B. Burt.....	Annie G. Crouch.
Attica.....	R. T. Madden, A. B.....	Mrs. Florence Stofer, B. S.
Basehor.....	Chas. W. Ashbaugh, A. B....	Lena E. Klamm, A. B.
Beattie.....	C. Kraemer.....	Elmira Stevenson.
Belle Plaine.....	P. N. Heck.....	Gertrude McClung, A. B.
Blue Mound.....	Ellen Dingus, B. S.....	J. D. Bower, A. B.
Brookville.....	T. J. Rollman.....	Winifred Martin.
Bunker Hill.....	Carl Ostrum, M. A.....	Ida M. Ostrum.
Canton.....	W. H. Wolfe, A. B.....	Emma Maughlin, A. B.
Carbondale.....	E. L. Heilmann.....	Mary M. Baird.
Cawker City.....	Euna Arrasmith, B. Ped....	Etta Arrasmith, B. Ped.
Cedar Vale.....	J. C. Straley.....	Ada McClellan, A. B.
Centralia.....	G. E. Whitcroft.....	Ethel Keller, A. B.
Clearwater.....	R. M. Crum.....	Gail Ross, A. B.
Clifton.....	E. C. Montgomery, A. B....	Stella Wangerien, A. B.
Coldwater.....	W. L. Dunbar, A. B.....	
Colony.....	O. F. Grubbs.....	Grace Sutherland, Ph. B.

## CLASS II — CONTINUED.

NAME OF SCHOOL.	Superintendent.	Principal.
Cunningham.....	J. W. Wilson.....	Ida Riley, A. B.
Delphos.....	H. W. Felter.....	Margaret E. Johnston, A. B.
Dixon Township.....		A. M. Herron.
Downs.....	R. M. Lockridge, B. S.....	Alice B. Ray.
Edwardsville.....		E. P. Kendall, A. B.
Ellinwood.....	H. E. Powers.....	Miss H. A. Minnis.
Elwood.....	B. G. Thayer.....	
Enterprise.....	O. L. Coleman, A. B.....	Agnes Eckblad, A. B.
Enterprise Normal Acad.		B. L. Katterjohn, B. S.
Erie.....	S. H. Howard, B. P.....	Mary Roseberry, Ph. B.
Eudora.....	Chas. Kelly.....	J. C. Reed, A. B.
Florence.....	H. E. Clewell.....	Ethel Ridnour.
Geneseo.....	S. O. Perkins.....	Dorothy Perkins.
Glasco.....	Jas. M. Alcorn, B. S.....	Mabel Seamans.
Glen Elder.....	R. L. Hamilton.....	Gertrude Walters, A. B.
Gray County,		
Cimarron.....		M. G. Cleary.
Kiowa County,		
Greensburg.....		N. F. Daum, M. A.
Gypsum.....	C. E. Tilford.....	Mary E. Tate.
Harveyville.....	B. F. Sinclair, A. B.....	Catherine Long, A. B.
Havensville.....	Frank Broom.....	Anna Graham.
Hill City.....	John C. Myrick.....	Mary H. Davidson.
Horton.....	W. W. Wood, A. B.....	Mabel O. Turner.
Irving.....	V. E. Worley, B. Pd.....	Mary Boal.
Jewell City.....	L. D. Griffee.....	
Kincaid.....	Vern McGuffey.....	Hattie E. Woods.
La Crosse.....	E. D. MacDougall, A. B.....	Erma Keister, A. B.
La Cygne.....	C. W. Thompson.....	Lanorah Lane, A. B.
Lane County,		
Dighton.....		E. E. Colyer, A. B.
Lansing.....	Ir J. Bright.....	C. G. Maier.
Lebo.....	C. T. Sherwood.....	Blanche Peters.
Leon.....	C. F. Smith, B. S.....	Etta Marshall.
Leoti.....		Agnes C. Baker.
Le Roy.....	A. M. Hambleton, M. A.....	J. Q. Wycoff.
Lewis.....	John A. Holmes.....	Millicent Boehme, A. B.
Liberal.....	F. O. Rindom.....	Edith Gamber.
Linwood.....	Fred F. Busch, A. B.....	Eleanor Sirpless, M. A.
Logan.....	R. G. Hepworth.....	Stella K. Stuart.
Lyndon.....	J. E. Watson, A. B.....	Mary H. Kirby.
Maplehill.....		F. D. Miller.
Marquette.....	Guy H. Jaggard.....	
McLouth.....	W. T. King.....	Rachel White, A. B.
Meriden.....	O. G. Rindom.....	Geraldine Stuart, A. B.
Mound City.....	V. E. Postma.....	Lottie Phillips.
Nazareth Academy,		
Concordia.....	Mother Antoinette.....	Sister Louise.
Ness City.....	C. L. Williams.....	
Nortonville.....	Jos I. Knott, A. B.....	Pearl Fisher, A. B.
Norwich.....	F. S. Hagy, B. S.....	Allie Lowhead, A. B.
Oswego.....	A. K. Loomis, A. B.....	Lu Rodgers.
Overbrook.....	I. T. Richardson, LL. M.....	Lillian Miller, B. L.
Perry.....	Fred Barrell.....	Grace Boyle, A. B.
Phillipsburg.....	Guy Warren.....	Jessie A. Gemmill.
Portis.....	L. F. Metzler.....	Mabel Nixon.
Reading.....	Ida L. Booth, A. B.....	Lucy E. Hall.
Redfield.....		Ellen Boyle, A. B.
Rose Hill.....		M. H. Harper.
Savonburg.....		William I. Jones, A. B.
Scott County,		
Scott.....		L. S. Runnels.
Scranton.....	Thomas J. Carder.....	Bertha M. Rightmire, A. B.
Spring Hill.....	George A. Allen, jr.....	Anna Sowers.
St. Marys.....	J. Merle Evans, A. B.....	Ida K. Moriarty.
Summerfield.....		Frank M. McClelland, A. B.

## CLASS II — CONCLUDED.

NAME OF SCHOOL.	Superintendent.	Principal.
Syracuse.....	H. E. Walter, A. B.....	Effie Markwell.
Valley Center.....	.....	J. V. Colville, B. S.
Vermilion.....	W. N. Wimmer, A. B.....	Minnie Moser.
Walden College, McPherson .....	David V. Brunstrom, M. A..	C. A. Peterson, A. B.
Wamego.....	J. P. McCoy .....	Grace C. Eaton, A. B.
Wathena.....	Chas. S. Todd.	.....
Waverly.....	Chas. A. Kalb, A. B.....	Charlotte Lewis.
Wellsville.....	B. W. Daily, A. B.....	Etta McCoy.
Westmoreland.....	F. W. Comfort.....	Minnie B. Pence.
Wetmore.....	George B. Neff, B. S.....	Agnes Laughlin, A. B.
White City.....	.....	J. L. Stevenson.
White Cloud.....	C. G. Landrum, A. B.....	Edna E. Biddison, B. S.
Wilson.....	H. Coover.....	Mary Thomas.

## CLASS III.

Schools listed in class III offer courses that have been approved by the University, but other conditions for accredited relations have not yet been entirely fulfilled.

NAME OF SCHOOL.	Principal.
Agra.....	H. B. Tibbels.
Almena.....	J. I. Burwell.
Barnard.....	J. W. Marston.
Belpre.....	C. N. Rankin.
Beverly.....	J. A. Feather.
Burr Oak.....	F. Eaton, B. S.
Coolidge.....	Carrie Beery, A. B.
Corning.....	W. R. Anthony.
Derby.....	C. D. Lank.
Easton.....	E. Voorhees.
Everest.....	J. B. Hitt, B. S.
Gardner.....	Edw. C. Paxton, A. B.
Garfield.....	C. C. Wise, Ph. B.
Greeley County, Tribune.....	R. C. Baer.
Haddam.....	L. A. Winsor.
Hiattville.....	J. D. Warren.
Hillsboro.....	Aug. H. Ponath, M. A.
Lebanon.....	S. A. Miller.
Lecompton.....	Ervin C. Ross, A. B.
Louisville.....	R. T. Kersey, B. S.
Lucas.....	C. E. Lewellen, M. S.
Moline.....	L. P. Breeden, A. B.
Moundridge.....	C. A. Yeomans, A. B.
Mount Hope.....	W. L. Baker.
Natoma.....	L. M. Spray, A. B.
Richmond.....	E. C. Pugh, A. B.
Rossville.....	W. G. Barker.
Sylvan Grove.....	George H. Hower, B. Ped.
Williamsburg.....	N. S. Welton.
Winchester.....	H. A. Baltz.

List of Kansas high schools accredited by the North Central Association for the year 1909:

NAME OF SCHOOL.	Superintendent.	Principal.
Abilene.....	W. A. Stacey.....	Frank E. Tyler.
Arkansas City.....	John F. Bender.....	E. A. Robinson.
Emporia.....	L. A. Lowther.....	Chas. A. Wagner.
Fort Scott.....	J. B. Stokesberry.....	J. F. Hughes.
Hiawatha.....	George G. Pinney.....	Raymond G. Taylor.
Holton.....	H. H. Van Fleet.....	H. W. Gowans.
Iola.....	L. W. Mayberry.....	W. H. Carothers.
Junction City.....	W. S. Heusner.....	J. W. Shideler.
Kansas City.....	M. E. Pearson.....	H. L. Miller.
Lawrence.....	F. P. Smith.....	F. H. Olney.
Leavenworth.....	G. W. Kendrick.....	Belle Wittrock.
Ottawa.....	A. L. Bell.....	R. E. Gowans.
Paola.....	F. K. Ferguson.....	E. L. Thompson.
Sumner County, Wellington.....		W. C. McCroskey.
Topeka.....	L. D. Whittemore.....	A. J. Stout.
Wichita.....	R. F. Knight.....	I. M. Allen.
Winfield.....	J. W. Spindler.....	J. W. Gowans.

Entrance credit is granted to any student from another state who is a graduate from a high school accredited by the North Central Association of Colleges and Secondary Schools and who can offer fifteen units of prescribed work as defined in the catalogue. Graduates from other high schools are accepted only by a special arrangement. No school is retained upon the accredited list of the University which fails to furnish data as required from time to time.

#### COMPARISONS FOR TWO YEARS.

	1908-'09.	1909-'10.
Number schools dropped.....	14	2
Number schools failing to report.....	10	3
Total number schools dropped from accredited list.....	24	5
Number schools continuing on accredited list.....	219	224
Number new schools added to all classes.....	10	38
Total number schools affiliated.....	229	262
Number schools fully accredited.....	133	140
Number schools partially accredited.....	78	91
Number schools working toward accredited relations.....	18	31

The total number of schools affiliated with the University for the year 1909-'10 is 262, which is an increase of 38 schools over the previous year. In every single point of comparison the advantage is in favor of the present year. The summary shows that only five schools have been dropped from accredited relations, three of which failed to respond to our request for information, and two have ceased to exist. The Gove county high school, which was organized in the year 1903, after a series of legal entanglements arising from the manner in which the school was established, was closed June, 1909, by a decision of the court. The second school which has ceased to exist as such is Lewis Academy, located at Wichita. By arrangement with the trustees of the Presbyterian College, at Emporia, the management of this school was trans-

ferred to the latter institution and the work of instruction is now carried on in connection with the Emporia College. The statistics therefore show that only five schools have ceased to continue accredited relations with the University during the year 1909-'10, while twenty-four schools were dropped from the list in 1908-'09. The greater number of these, however, were schools located in other states, which schools are now recognized by the University only by special agreement or through the accredited system of the North Central Association of Colleges and Secondary Schools.

It is also of interest to note that 38 new schools were added, while only 10 were added in the year 1908-'09. During the previous year 133 schools were fully accredited; during the present year 140 schools are fully accredited, an increase of only 7. This small increase is offset somewhat by the fact that for the year 1909-'10 231 schools are recognized in the first two lists, while for the previous year only 211 schools were listed in the same class, which shows an increase of 20 schools, or a little over nine per cent.

There has also been a very satisfactory increase in the number of schools affiliated but not fully accredited by the University. Our policy has always been to work in harmony and sympathy with the smaller schools, even though they may not be able to meet entrance requirements. The schools so listed have submitted courses of study which are in harmony with College requirements and are rapidly approaching a complete four-year high-school course of study. Many of these schools are organized within the Barnes law counties and are enabled to expand their educational facilities through the assistance received by the provisions of this law.

One of the greatest difficulties in accrediting schools arises from the fact that principals and superintendents are often overzealous to have their schools rank in the first class. They urge the advancement of their schools before conditions are right. We sometimes find a school with complete equipment and a good corps of teachers but the student body incapable of doing high-grade work, because of insufficient preparation or because in previous years educational facilities were too meager. Before a school should be listed in class I the equipment should be ample, the instructors competent, thorough, exacting, and the student body capable of doing a high grade of work. Such conditions require more or less time for complete development, and to force advancement against natural and reasonable limitations is a great injustice to the school from any point of view.

To take the supervision of a school in a state of educational chaos, organize it for administrative purposes, prepare its curriculum and grade the students, provide laboratory facilities, build a library, and inaugurate a wholesome school spirit which will compel every student to take a pride in his work and a personal interest in the standing of the school, is a laudable ambition for any principal and a service which is most commendable; but to accomplish all these things, under the most favorable conditions, would require at least two years, and in a great majority of cases it would be better done were three years devoted to its accomplishment. It is not a discredit to any management to state here that all of the schools listed in class I do not in every respect fulfill the ideal conditions toward which we are all striving. There is a bor-

der line along which must be placed schools representing the best of class II and the poorest of class I. The exact difference between the two classes thus situated would be difficult to define; in fact, it does not matter much what the difference may be. The point which needs to be kept in mind is this: that the normal condition of a school should be one of growth and development, and if this condition is being realized it is immaterial whether the school is found in the first, second or third class. And furthermore, if this condition is maintained for sufficient time there is no question but that the coveted goal will finally be reached and all the schools will be found listed in class I.

The statement is often made by schoolmen who are in a position to speak with authority, that the standard of results reached in the elementary schools is not as high as we have a right to expect. In fact, it is now generally conceded that there is less clear thinking upon method, organization, and other familiar problems of the grade school than in any other department of public education, and this thought applies with special emphasis to the small schools. In these small schools, of which there are in the state about 130, the superintendent is usually without special training for this line of work, and sometimes undertakes the management of a system of grades without any actual experience either in teaching or any serious study of the fundamental principles which should govern this particular field.

Again, the superintendent of the small school is obliged to teach from three to six recitations per day in the high school. This not only takes his time, but it divides his interest, always in favor of the high school. Such conditions prevailing, it would hardly be reasonable to expect a well-graded system or unity of effort in the conduct of the elementary school.

Whether the claims made on this point are correct or not, the fact remains that a very large per cent of the students entering the high school from the grades experience great difficulty in mastering high-school subjects, and so long as this is true it will be impossible to reach a reasonably high standard of efficiency in the secondary schools. A satisfactory system of education must be strong in all of its departments.

TABLE I. Population of towns, school enumeration, total enrollment, and high-school enrollment by years.

NAME OF SCHOOL.	Population of town...	School enumeration...	Total enrollment.....	High-school enrollment.					Number of teachers in high schools.....	Instructors with degrees.....	Graduates of normal schools.....	Instructors with no degrees.....
				First year.....	Second year.....	Third year.....	Fourth year....	Total.....				
Abilene.....	5,000	1,300	900	82	47	38	32	199	7	7	0	0
Agra.....	400	.....	130	18	2	5	7	32	2	0	0	2
Alden.....	600	132	140	10	5	8	11	34	3	1	0	2
Alma.....	1,200	347	210	13	16	22	8	59	4	4	0	0
Almena.....	1,100	326	225	14	7	6	3	30	2	0	2	0
Alta Vista.....	500	179	170	20	3	5	2	30	3	0	2	1
Altoona.....	1,600	458	350	21	12	8	4	45	4	0	3	1
Anthony.....	3,000	867	700	38	17	28	20	103	4	5	0	0
Argentine.....	7,000	1,985	1,205	54	41	35	16	146	5	3	1	1
Arkansas City.....	8,000	1,801	1,340	76	58	37	14	185	7	6	0	1
Ashland.....	1,200	1,275	234	14	14	5	2	35	3	3	0	0
Atchison.....	16,000	3,622	1,660	95	56	31	17	199	8	7	1	0
Atchison County, Effingham	.....	.....	.....	28	26	24	10	88	8	3	2	0
Attica.....	1,200	278	266	17	18	15	4	54	3	3	0	0
Augusta.....	1,800	.....	400	38	25	14	1	78	4	2	2	0
Axtell.....	800	290	260	21	19	16	10	66	3	2	0	1
Barnard.....	400	141	110	7	4	1	2	14	2	0	0	2
Basehor.....	200	130	103	14	4	8	2	28	2	2	0	2
Beatrice.....	1,000	243	192	10	15	9	8	42	2	0	0	2
Belle Plaine.....	1,000	248	241	22	18	8	12	60	3	1	1	1
Belleville.....	2,500	696	570	44	34	18	16	112	4	4	1	0
Belott.....	2,891	810	49	48	38	34	12	133	6	1	1	1
Belpre.....	.....	168	140	7	5	4	0	16	2	0	1	1
Bethel Academy, Newton	.....	.....	.....	48	33	25	14	120	6	4	0	2
Beverly.....	.....	110	81	4	2	0	0	6	1	0	0	1
Blue Mound.....	500	169	131	12	6	4	5	27	2	2	1	0
Blue Rapids.....	1,900	409	400	30	21	3	3	63	4	3	0	1
Bonner Springs.....	1,800	500	318	21	7	6	11	45	3	3	0	0
Bronson.....	600	207	192	20	19	13	6	58	3	0	1	2

TABLE I. Population of towns, school enumeration, total enrollment, and high-school enrollment by years—*continued*.

NAME OF SCHOOL.	Population of town...	School enumeration...	Total enrollment.....	High-school enrollment.					Number of teachers in high schools.....	Instructors with degrees.....	Graduates of normal schools.....	Instructors with no degrees.....
				First year.....	Second year.....	Third year.....	Fourth year....	Total.....				
Brookville.....	350	178	130	12	8	9	0	29	2	0	1	1
Bunkerhill.....	130	134	130	12	8	2	1	23	2	1	0	1
Burden.....	500	219	199	17	9	12	9	47	3	3	1	0
Burlingame.....	495	575	495	35	24	20	14	93	4	3	0	0
Burlington.....	2,220	673	448	45	12	8	8	73	4	4	1	0
Burr Oak.....	800	258	250	37	13	7	.....	57	2	1	0	0
Burton.....	800	197	195	19	13	6	8	46	3	4	1	0
Caldwell.....	3,000	688	620	41	21	12	12	86	4	3	1	0
Caney.....	4,642	1,158	900	28	11	15	5	59	3	3	2	0
Canton.....	600	205	173	23	5	6	3	37	2	1	0	0
Carbondale.....	500	160	160	15	13	8	10	46	2	2	0	0
Cawker City.....	1,000	257	233	14	14	9	8	45	3	3	0	0
Cedar Vale.....	1,100	325	310	17	14	4	3	38	2	1	1	0
Centralia.....	1,000	245	210	26	13	12	8	59	2	1	0	0
Chanute.....	10,000	2,600	1,945	92	60	44	36	232	8	6	2	0
Chase County, Cottonwood Falls.....	.....	.....	.....	33	35	22	17	107	4	4	0	0
Chase County, Kansas City.....	3,000	956	763	56	34	20	15	125	7	7	1	0
Cheney.....	700	220	239	32	9	15	16	72	3	3	0	0
Cherokee County, Columbus.....	.....	.....	.....	120	86	75	72	353	13	5	1	3
Cherryvale.....	41	32	32	20	32	20	20	113	4	3	1	0
Clay County, Clay Center.....	6,000	1,335	1,260	101	77	68	71	317	11	7	4	0
Clearwater.....	600	141	173	23	11	15	7	56	2	1	1	0
Clifton.....	1,200	265	212	13	14	6	6	39	2	2	0	0
Clyde.....	1,500	365	286	11	9	10	1	31	3	3	0	0
Coffeyville.....	20,000	4,025	3,038	116	70	80	23	289	12	2	0	0
Coldwater.....	600	250	221	28	9	8	2	47	3	3	0	0
Colony.....	.....	193	194	15	26	16	11	68	3	1	1	0
Concordia.....	4,712	1,191	600	49	32	17	22	120	5	5	1	0

Coolidge.....	160	60	4	8	2	2	11	2	0	0
Corning.....	500	178	12	7	5	0	24	0	0	0
Council Grove.....	2,666	686	45	26	15	15	102	0	0	0
Crawford County, Cherokee.....		513	95	15	12	12	143	5	6	0
Cunningham.....	400	140	12	4	6	0	22	4	2	0
Decatur County, Oberlin.....		106	52	34	30	24	140	1	1	1
Delphos.....	800	250	16	13	5	0	38	1	1	0
Derby.....	500	135	17	10	3	0	30	2	1	0
Dickinson County, Chapman.....		105	59	67	35	39	200	4	1	4
Dixon Township, Argonia.....	800	35	15	12	8	5	35	2	1	0
Dodge City.....	5,000	713	54	22	16	16	108	5	5	0
Douglas.....	900	275	17	16	14	10	57	3	2	0
Downs.....	1,800	514	29	13	12	10	64	3	1	1
Easton.....	500	150	22	9	3	0	84	2	1	0
Edwardsville.....	150	74	3	3	2	1	9	0	0	0
El Dorado.....	4,000	962	81	36	23	23	163	8	4	3
Ellinwood.....	1,037	319	15	13	6	0	34	0	2	0
Ellis.....	1,500	413	15	7	8	10	40	3	0	0
Ellsworth.....	2,100	575	30	12	9	9	60	4	3	0
Elwood.....	847	291	11	4	4	4	15	0	0	1
Emporia.....	10,000	2,843	162	91	66	29	38	2	2	2
Enterprise.....	850	280	22	5	5	5	43	3	1	0
Enterprise Normal Academy.....		260	15	10	10	7	42	2	1	2
Erie.....	1,800	.....	17	7	10	8	37	3	1	0
Esksridge.....	1,000	206	38	13	8	31	72	4	3	0
Eudora.....	675	243	9	12	3	7	81	2	1	0
Eureka.....	2,510	810	66	26	21	23	136	6	5	0
Everest.....	600	189	7	6	7	0	20	1	0	1
Florence.....	1,400	446	13	15	11	4	43	3	0	0
Fort Scott.....	15,000	3,564	90	54	39	39	233	0	4	0
Frankfort.....	1,500	458	34	17	23	23	103	4	3	1
Franklin, Kiowa.....	1,700	503	19	12	6	8	45	3	2	0
Fredonia.....	3,500	858	29	26	11	12	78	4	3	1
Galena.....	6,749	1,908	49	35	26	31	141	6	4	1
Garden City.....	3,700	832	91	17	22	11	95	5	2	1
Gardner.....	800	225	26	16	15	4	61	2	1	1
Gardner.....	800	218	5	8	8	0	11	1	0	0
Garfield.....	100	.....	5	8	8	0	11	1	0	0
Garnett.....	2,500	661	42	38	28	14	120	5	0	0
Gas City.....	1,500	668	18	7	2	5	27	4	2	2
Geneseo.....		151	3	14	1	0	18	0	1	0
Girard.....	3,000	872	46	28	12	12	98	2	4	1
Glascow.....	800	260	24	14	4	7	49	1	0	0
Glen Elder.....	500	171	12	8	6	6	32	3	1	0
Gray County, Cimarron.....		154	15	11	6	4	36	2	0	0

TABLE I. Population of towns, school enumeration, total enrollment, and high-school enrollment by years—*continued*.

NAME OF SCHOOL.	Population of town...	School enumeration...	Total enrollment.....	High-school enrollment.					Number of teachers in high schools.....	Instructors with degrees.....	Graduates of normal schools.....	Instructors with no degrees.....
				First year.....	Second year.....	Third year.....	Fourth year....	Total.....				
Great Bend.....	5,000	1,270	.....	59	41	20	15	135	7	5	0	2
Greenleaf.....	900	301	246	19	11	8	13	51	3	2	0	1
Gypsum.....	650	211	190	12	9	10	6	37	2	0	0	0
Haddam.....	450	130	111	15	4	0	0	20	1	0	0	1
Halstead.....	1,100	364	252	25	26	10	12	73	5	4	0	1
Harper.....	2,000	552	401	35	17	6	16	74	4	4	0	0
Hartford.....	1,100	273	167	24	14	12	7	57	3	2	1	0
Harveyville.....	1,300	161	135	8	4	4	2	18	3	2	1	0
Havensville.....	750	300	165	11	6	5	7	29	3	0	1	1
Hays.....	2,025	557	270	18	9	11	7	45	3	0	3	0
Herington.....	3,700	980	662	42	27	10	17	96	5	5	0	0
Hiawatha.....	3,500	904	610	35	19	15	23	92	5	5	0	0
Hiattville.....	1,100	.....	70	6	7	10	10	33	1	0	0	1
Hill City.....	1,000	306	277	33	10	8	6	57	3	0	3	0
Hillsboro.....	1,300	455	264	7	3	6	0	16	1	1	0	0
Hoisington.....	2,200	514	425	34	16	10	7	67	3	3	0	0
Holton.....	3,800	900	650	37	29	26	23	115	6	6	0	0
Horton.....	4,000	1,200	805	54	30	21	8	113	4	2	2	0
Howard.....	1,500	337	296	20	19	9	10	58	3	0	1	0
Humboldt.....	2,600	713	582	28	27	14	10	79	4	3	0	2
Hutchinson.....	16,009	3,849	2,450	140	85	35	36	296	11	7	2	1
Iola.....	12,000	3,110	2,547	114	84	71	35	304	10	7	2	2
Irving.....	400	186	148	16	16	5	6	43	2	1	1	1
Jewell City.....	1,050	275	270	37	16	11	5	69	4	1	0	0
Junction City.....	7,250	1,945	1,340	73	49	40	29	191	7	6	2	1
Kansas City.....	102,800	18,971	10,806	362	198	164	110	834	40	24	1	0
Kincaid.....	500	175	155	25	9	6	8	48	2	0	2	0
Kingman.....	3,000	794	690	85	63	40	27	215	8	6	1	1

Kinsley.....	1,535	521	488	40	22	14	14	90	4	2	2	0	0
Kiowa County, Greensburg.....				29	16	7	2	54	3	3	4	0	0
Labette County, Altamont.....				64	44	38	82	178	8	2	1	1	3
La Crosse.....	900	241	196	12	11	11	7	41	3	2	0	0	0
La Cygne.....	1,400	380	300	19	18	7	7	51	3	2	1	1	1
La Harpe.....	2,100	684	551	29	17	13	8	67	4	2	2	0	0
Lane County, Dighton.....				21	7	6	4	38	3	0	2	0	0
Lansing.....	1,000		230	21	16	10	6	53	3	0	2	2	1
Larned.....	3,000	805	673	42	30	21	16	109	4	2			0
Lawrence.....	13,367	3,211	2,400	212	128	110	71	521	17	14	0	0	3
Leavenworth.....	23,004	6,950	3,004	140	73	41	41	294	12	9	0	3	3
Lebanon.....	1,200		242	37	7	16	0	60	2	1	1	0	0
Lebo.....	600	200	167	15	10	9	8	37	3	0	3	0	0
Lecompton.....	500		150						2	2	0	0	0
Leon.....	650	172	156	24	7	2	6	39	2	1	1	0	0
Leoti.....	884	150	125	11	7	4	7	15	2	0	0	3	0
Le Roy.....	1,200	248	235	30	19	5	3	61	3	0	1	0	0
Lewis.....	600	177	155	7	11	3	3	24	2	1	0	1	1
Liberal.....	2,000	415	407	22	16	10	3	51	3	1	1	1	1
Lincoln.....	1,700	699	408	32	25	21	16	94	5	2	3	0	0
Lindsborg.....	2,200	523	260	19	8	9	8	46	3	2	0	1	1
Linwood.....	500	142	125	18	11	8	4	41	3	3	0	0	0
Little River.....	633	282	210	22	6	6	10	44	3	3	0	0	0
Logan.....	1,001	282	248	20	7	14	6	47	3	0	0	3	0
Louisville.....	400		112	12	6	0	0	18	1	1	0	0	0
Lucas.....	626		166	3	8	0	2	13	2	2	0	1	1
Lyndon.....	1,000	250	240	34	23	16	6	79	3	2	0	1	1
Lyons.....	1,800	541	476	34	25	25	19	103	5	3	1	1	1
Mankato.....	1,200	392	395	49	25	30	23	127	5	3	1	1	1
Maplehill.....	400	130	123	5	5	2	0	12	2	0	0	2	0
Marion.....	2,163	554	444	28	18	13	11	70	5	3	2	0	0
Marquette.....	2,950	326	326	24	10	8	4	46	3	1	2	0	0
Marysville.....	2,500	800	350	29	30	13	12	84	4	4	0	0	0
McLouth.....	800	201	160	13	6	1	7	27	2	2	1	0	0
McPherson.....	3,700	1,000	800	40	36	34	17	127	5	5	3	1	1
Medicine Lodge.....	1,500	486	427	46	25	16	15	102	2	3	1	0	0
Meriden.....	500	165	152	18	9	6	2	35	2	2	1	0	0
Minneapolis.....	2,300	520	435	48	14	16	14	92	5	3	1	1	1
Moline.....	900	262	221	13	4	5	5	27	2	1	1	1	1
Montgomery County, Independence.....				149	63	62	46	320	10	3	6	1	1
Moran.....	700		193	32	21	10	4	67	3	3	0	0	0
Mound City.....	900	196	182	18	10	9	7	44	2	0	2	1	1
Mount Hope.....	800			9	6	1	1	17	2	0	1	1	1
Moundridge.....	626	264	185	6	12	8	7	33	2	1	0	0	0

TABLE I. Population of towns, school enumeration, total enrollment, and high-school enrollment by years—continued.

NAME OF SCHOOL.	Population of town...	School enumeration...	Total enrollment.....	High-school enrollment.					Number of teachers in high schools.....	Instructors with degrees.....	Graduates of normal schools.....	Instructors with no degrees.....
				First year.....	Second year....	Third year.....	Fourth year ...	Total.....				
Natoma.....	400	.....	105	10	1	4	2	17	2	2	0	0
Nazareth Academy, Concordia.....	.....	.....	.....	16	22	20	18	76	7	0	0	0
Neodesha.....	4,300	865	700	19	24	12	11	66	0	0	1	2
Ness City.....	650	.....	.....	42	215	10	5	67	0	0	2	1
Newton.....	9,000	2,394	1,325	96	59	26	29	210	3	3	3	3
Norton County, Norton.....	.....	.....	.....	73	55	39	22	189	6	2	0	0
Nortonville.....	700	205	183	22	7	8	7	44	2	2	0	0
Norwich.....	550	199	184	6	9	4	4	23	2	2	0	0
Oakley.....	1,200	223	228	21	18	13	10	62	3	3	1	0
Olathe.....	4,000	1,256	734	91	55	28	24	198	5	5	1	3
Onaga.....	800	240	215	23	14	2	6	45	2	2	1	0
Osage City.....	2,800	948	638	24	14	15	10	63	3	4	0	0
Osawatimie.....	.....	1,001	589	40	18	20	6	84	4	4	2	0
Osborne.....	1,600	428	380	49	26	15	15	105	4	4	0	0
Oskaloosa.....	1,200	300	240	30	14	10	9	63	2	2	2	0
Oswego.....	2,500	737	449	28	12	28	6	74	4	4	0	1
Ottawa.....	8,000	2,170	1,478	102	58	36	17	213	5	5	3	3
Overbrook.....	600	180	170	16	12	12	10	50	2	2	0	0
Paola.....	3,800	871	599	55	43	35	25	158	7	5	1	1
Parsons.....	15,195	3,101	2,207	129	57	37	38	261	11	5	5	1
Peabody.....	1,750	382	332	24	21	9	15	69	4	3	0	1
Perry.....	429	.....	138	17	16	5	3	41	3	2	0	1
Phillipsburg.....	2,000	443	372	34	12	10	0	56	3	1	2	2
Pittsburg.....	17,000	5,615	3,215	155	128	85	49	417	11	3	8	0
Plainville.....	1,200	320	287	25	9	7	14	55	4	2	2	0
Pleasanton.....	1,600	450	340	38	23	8	8	77	3	3	0	0
Portis.....	400	142	132	9	15	4	3	31	2	0	2	0
Pratt.....	3,800	730	722	68	34	34	23	159	7	4	1	2

Rawlins County, Atwood.....	450	140	124	36	16	11	7	70	4	3	0	1
Reading.....	200	120	99	12	4	6	3	25	2	1	0	1
Redfield.....				11	7	2	4	24	9	1	0	1
Reno County, Nickerson.....				126	69	61	20	276	9	7	1	2
Richmond.....	400		125	12	14	7	0	33	1	1	0	0
Rosedale.....	7,000	2,200	1,300	52	30	17	14	113	1	4	1	0
Rose Hill.....	200	160	135	8	8	7	2	20	3	0	2	1
Rossville.....			142	9	1	0	0	10	1	0	0	1
Russell.....			421	44	23	18	15	100	3	0	3	0
Sabetha.....	2,200	602	540	43	36	42	29	150	6	5	0	1
Salina.....	10,000	2,417	1,611	133	68	56	36	293	11	3	2	3
St. John.....	1,600	430	450	45	35	25	20	125	6	3	1	0
Savonburg.....	350	105	78	6	1	4	0	11	2	2	0	0
Scott County, Scott.....				25	9	11	3	48	2	0	0	2
Scranton.....	850	326	42	15	9	12	6	42	2	1	2	0
Sedan.....	1,250	469	442	31	11	9	11	62	4	1	1	1
Sedgewick.....	610	257	203	20	15	6	10	51	3	3	0	0
Seneca.....	2,100	605	382	36	25	21	12	94	4	4	0	0
Sharon Springs.....	500	150	110	15	1	0	2	18	3	1	1	1
Sheridan County, Hoxie.....				21	14	10	10	55	3	2	1	0
Sherman County, Goodland.....				22	18	12	9	61	5	5	0	0
Smith Center.....	1,576	485	410	44	28	18	11	101	4	4	0	0
Solomon.....	1,400	340	300	22	19	6	3	50	3	1	1	1
Southern Kansas Academy.....				12	10	6	9	37	6	3	0	3
Spring Hill.....	650	156	163	15	21	12	10	58	3	0	2	1
Stafford.....	1,781	543	471	45	36	23	16	120	6	4	1	1
Sterling.....	2,300	650	600	62	51	34	29	176	7	5	0	2
Stockton.....	1,443	371	303	27	24	15	7	73	4	2	2	0
St. Mary's.....	1,700		235	12	11	5	0	28	2	1	1	0
St. Mary's Academy, Leavenworth.....				21	13	9	8	51	8	0	0	8
Summerfield.....			168	11	14	10	3	38	2	1	1	0
Sumner (Kansas City).....	100,000	18,971	10,806	68	43	28	17	156	10	6	1	3
Sumner County, Wellington.....				150	74	46	30	300	15	10	1	4
Sylvan Grove.....	600	150	90	7	7	0	0	14	1	1	0	0
Syracuse.....	1,200	307	218	15	2	9	8	29	3	1	2	0
Thomas County, Colby.....				34	23	12	10	79	4	3	1	0
Tonganoxie.....	1,100	330	326	47	24	10	16	97	5	2	2	0
Topeka.....	50,000	11,491	6,421	410	244	191	155	1,000	39	27	4	8
Trego County, Wa Keeney.....	4,600			33	27	22	18	100	4	4	0	0
Tribune.....				18	1	0	0	19	1	0	0	1
Troy.....	1,000		270	18	23	16	11	68	4	2	2	0
Valley Center.....	700		135	19	13	6	2	40	2			

TABLE I. Population of towns, school enumeration, total enrollment, and high-school enrollment by years—concluded.

NAME OF SCHOOL.	Population of town...	School enumeration...	Total enrollment.....	High-school enrollment.					Number of teachers in high schools.....	Instructors with degrees .....	Graduates of normal schools.....	Instructors with no degrees.....
				First year.....	Second year.....	Third year.....	Fourth year ...	Total.....				
Valley Falls .....	1,080	381	278	29	18	11	6	64	4	0	3	1
Vermilion.....	450	150	118	10	8	2	4	24	2	1	1	0
Walden Academy, McPherson.....				6	3	3	2	14	4	1	1	1
Warago.....	2,120	520	350	27	23	14	18	82	3	4	0	0
Washington .....	1,800	464	422	41	28	24	15	108	4	4	0	0
Waterville.....				220	17	17	11	65	3	1	3	0
Wathena.....	950	335	276	23	12	6	10	51	4	1	1	1
Waverly.....			220	30	15	14	7	66	3	1	0	0
Wellsville.....	600	214	210	17	12	9	9	47	2	1	1	1
Westmoreland.....	723	166	176	14	12	7	3	36	2	0	0	2
Wetmore.....	600	231	195	16	16	9	9	50	3	1	1	0
White City.....	700	250	214	19	10	7	2	38	2	1	1	0
White Cloud.....	800	263	190	10	9	7	5	27	2	1	0	0
Wichita.....	50,000	9,353	7,833	314	242	127	108	791	25	22	0	3
Williamsburg.....			165	10	8	3	2	23	2	0	1	1
Wilson.....	975	380	252	18	16	6	5	45	3	0	1	2
Winchester.....	600	206	173	23	8	8	0	39	3	0	1	1
Winfield.....	7,500	2,040	1,475	111	86	44	34	275	2	0	1	0
Yates Center.....	2,500	532	430	50	22	30	17	119	9	7	2	2

**SUMMARY A.** A comparison of summaries for the years 1907-'08, 1908-'09, 1909-'10.

	1907-'08.	1908-'09.	1909-'10.
Total number in first year.....	8,355	9,133	10,046
Total number in second year.....	5,307	5,869	6,247
Total number in third year.....	3,620	3,980	4,504
Total number in senior year.....	2,555	3,026	3,278
Total high-school enrollment.....	19,837	22,008	24,075
Total number of instructors.....		993	1,157
Total number instructors with degrees.....		615	693
Total number normal graduates.....		251	236
Total number without degrees.....		127	228

The summaries indicated in the above table will give some idea of the magnitude of high-school work in the state of Kansas, and they will also show very clearly the rapidity of growth and development in this department of education.

Much care has been taken in the preparation of these tables, and we take some pride in calling the attention of the University authorities, as well as those actively engaged in secondary educational pursuits, to the favorable conditions which they represent. The total enrollment for the year 1909-'10 reaches 24,075, which is an increase of 9 per cent over the total enrollment of the previous year. The figures also indicate an increase in the number of seniors of over 8 per cent, the numbers being 3278 for the year 1909-'10 and 3026 for the years 1908-'09. Of this number 41.3 per cent are boys, which I find to be about the same ratio between boys and girls that exists in other states. This we have reason to believe will continue to increase by a small margin for a few years to come.

Another matter of some significance is the fact that of the 3026 seniors who graduated in June, 1909, 811 entered college last September, which is 26.7 per cent of the total number of graduates. Of this number, however, 15 per cent are attending colleges in other states, leaving high-school graduates enrolled in the colleges of the state in September, 1909, 689. The total number of seniors graduating in June, 1909, who entered college, was 3.7 per cent of the total high-school enrollment. These figures are probably as accurate as can be secured, and since we have no data for former years at hand it is impossible to make any comparison. All things considered, it would not seem to be a very high average.

The reports show a large decrease in the number of senior boys as compared with the number of girls. Of the 3278 seniors, 1036 are boys, or 33½ per cent of the total number, as compared with 39 per cent of last year. The enrollment of girls in the senior class of 1910 represents an increase of 28 per cent over last year, while the number of boys shows a loss of 8 per cent.

There has also been quite an increase in the number of high-school instructors. The last report showed in all 993 high-school instructors, including superintendents who taught more than two subjects. The year 1909-'10 shows an addition of 164 instructors, making a total of 1157, which is an increase of 16 per cent. Considering the entire number of high-school instructors, together with superintendents who teach more than two classes per day, 492, or 42.5 per cent, are men, which shows that the number of

men teachers compared with the number of women teachers is still increasing; the per cent last year being 42.1 per cent men. Had it been possible to secure men teachers who were prepared to do creditable high-school work, this difference would have been much less than the present showing.

SUMMARY B. Enrollment by study groups.

	Boys.	Girls.
<b>GROUP I. English:</b>		
Freshmen .....	4,108	5,326
Sophomore.....	2,439	3,489
Junior.....	1,368	2,247
Senior.....	629	1,229
<b>GROUP II. Mathematics:</b>		
First year algebra.....	4,240	5,612
Algebra (quadratics).....	1,502	2,187
Plane geometry .....	2,005	3,008
Advanced algebra.....	139	199
<b>GROUP III. Foreign Languages:</b>		
Latin:		
First year.....	3,104	4,283
Cæsar.....	1,359	2,118
Cicero.....	811	1,300
Vergil.....	218	520
German:		
Beginning.....	1,271	1,766
Second year.....	442	819
Third year.....	118	204
Greek.....	15	5
French.....	26	79
<b>GROUP IV. Physical Sciences:</b>		
Physical geography.....	1,909	2,717
Physics.....	1,233	1,623
Chemistry.....	409	450
<b>GROUP V. Biological Sciences:</b>		
Botany.....	1,895	2,168
Zoology.....	151	148
Physiology.....	248	412
<b>GROUP VI. History:</b>		
Greek and Roman.....	2,703	3,733
Medieval and modern.....	907	1,225
English.....	255	396
American.....	925	1,646
Economics.....	168	256
Civics.....	424	625
<b>GROUP VII. Vocational Subjects:</b>		
Woodwork.....	1,299	96
Drawing.....	738	638
Domestic art.....	114	1,317
Domestic science.....	130	578
Agriculture.....	77	67
Bookkeeping.....	937	1,057
Commercial law.....	202	186
Commercial geography.....	250	299
Psychology.....	309	907
Methods and management.....	120	368

The demand for industrial and educational subjects is constantly increasing. The law passed by the legislature of 1909, setting aside \$50,000 a year for high schools maintaining an educational course approved by the State Board of Education, has been the means of attracting many high-school students toward the profession of teaching. This accounts for the largely increasing numbers found in the educational subjects, such as psychology and methods. This fund is distributed by the state superintendent among 100 high schools of the state which fulfill the requirements, first, that there must be enrolled at least ten students in educational subjects, and second, that these students must take a final examination, on the completion of which a certificate will be granted to all who are successful, to teach in the common schools of the state. The schools must also fulfill other conditions for fully accredited relations with the University. This law will undoubtedly be the means of increasing the number of those who pass from the high schools directly into the profession of teaching, and it will also guarantee a better trained class of teachers for the elementary and rural schools.

The University gives a maximum of one entrance credit for educational work carried in the accredited high schools. From the fact that the teaching force in the high school has increased rather more rapidly than the increase in the number of students, the average class enrollment is somewhat lower than it was in the last report. The present enrollment shows that there are twenty-three students to each instructor, and only three schools in the state average more than thirty pupils per teacher in the high school, namely, Montgomery County, Russell, and Pittsburg. The maximum of thirty pupils is the standard for average class membership determined by the North Central Association of Colleges and Secondary Schools.

The summary shows the enrollment by subjects giving the number of students, boys and girls, enrolled in the various high-school classes. The smallest number of students enrolled in any single branch is that of Greek, the total number being but 20 students. French exceeds Greek by 85 students, representing in all 105 students in all of the high schools in the state. There is a very noticeable increase in practically all of the other subjects, but such increase is distributed in about the same proportion as the total enrollment has increased.

Zoölogy is taught in only eighteen schools, which is less than in previous years. Economics is taught in forty-one high schools with a total enrollment of 454 students. Agriculture is taught in thirteen schools with an enrollment of 144 students. The normal-training subjects have made a decided increase. The table shows that psychology is taught in one hundred and three high schools, and that 1216 students are enrolled in the subject. Classes in methods and management are being conducted in fifty-four high-schools with a total enrollment of 488. There is but little change in the business or commercial department. One hundred and nine schools offer courses in bookkeeping, thirty-seven schools in commercial law, and thirty-two schools in commercial geography. Nineteen schools are equipped for and are conducting classes in domestic science, and twenty-six schools in domestic art; the latter with an enrollment of 1431 students. There has been a very

satisfactory increase in the number of schools offering drawing, and yet the number is far less than it should be. At present there are enrolled 1376 students in this subject, or about five per cent of the total enrollment.

While drawing may not be one of the most important subjects of study in the high school, most people very greatly underestimate its value. They look upon it as a mere tool or as only an accomplishment. It is both, and high-school pupils should be furnished with both tools and accomplishments; for both are needed for success in life. But drawing is far more than both.

An ability to draw is needed in mechanical work of all kinds, hence is necessary in almost every industry, especially if a man is to rise at all above the lowest level. And when one gets up into the higher branches of mechanical work, and into civil and electrical engineering, drawing is absolutely indispensable. Then building of all kinds, both in its lower forms and in its higher realm, which by reason of stateliness and beauty we dignify with the term architecture, needs the draftsman. Nor can we hope to develop genuine artists in architecture, whom we so much need, any more than great sculptors or painters, unless drawing become a fundamental element in our education. Moreover, every one who expects to teach any branch of knowledge whatsoever needs an ability to draw. The best teachers are those who can illustrate their subjects graphically—can on occasion reach the mind through the eye. That will not simply make a difficulty clear to a willing pupil, but also attract an inattentive or unwilling pupil.

But apart from its practical side, drawing is of great value. It develops powers of observation, and brings the hand and eye under the control of the mind. Constant repetition of this subordination in drawing tends to make it a habit which extends into other fields, and gradually brings the other members and capacities of the body under the same control, and subordinates material interests to intellectual. The ideas of adaptation and application are brought clearly to the attention, and the value of an evident purpose as the real motive of activity is emphasized. That means thoughtfulness, seriousness, breadth of mind, careful observation of conditions and calculation of probabilities before action, trained decision. That means influence on the moral character, tending to make a thoughtful citizen, not a partisan; a man or woman of sound and sober judgment in private and social life.

Then the training of the eye that comes from drawing leads to an appreciation of outline and contour that sees the beauty all around us in the hills and valleys, the flowers and leaves and trees, the rivers and lakes, the houses and their furnishings, and even the carriage and deportment of the men and women and children in them. And who can calculate the pleasure we derive from our appreciation of beauty? Then, the higher our appreciation of beauty, the more will we enjoy the nobler works of art as seen in great architecture, sculpture and painting, the great majority of which have a profound influence on moral and spiritual life; and the more likely are we to develop the great artists that will profoundly influence our people's moral and spiritual life.

For these three reasons, then, drawing should be taught and studied: for its practical use, for its moral and spiritual influence, and for its power to increase the happiness of our people.

TABLE II. Salaries.

NAME OF SCHOOL.	Salary of superintendent.....	Salary of principal....	Average salary of assistants.....	Average salary of grade teachers.....	Number of pupils in grades.....	Number of teachers in grades.....	Average number of pupils per teacher in grades.....	Average number of pupils per teacher in high schools.....	Maximum number of classes per teacher..	Number of weeks in school year.....
Abilene.....	\$1,500 00	\$900 00	\$70 00	\$50 00	701	17	41	29	6	36
Agra.....	1,000 00	675 00	60 00	50 00	98	3	32	16	6	36
Alden.....	1,350 00	810 00	65 00	55 00	106	3	38	11	6	36
Alma.....	900 00	810 00	67 50	60 00	151	4	35	15	5	36
Almena.....	900 00	810 00	55 00	51 00	195	5	39	15	6	36
Alta Vista.....	900 00	675 00	70 00	65 00	140	3	46	10	6	36
Altoona.....	1,500 00	585 00	62 50	50 72	305	7	43	11	7	36
Anthony.....	1,620 00	722 00	60 00	50 00	597	14	42	20	6	36
Argentine.....	1,500 00	900 00	70 41	50 31	1,044	26	40	32	6	36
Arkansas City.....	1,000 00	585 00	62 50	54 51	1,155	31	37	26	6	36
Ashland.....	1,800 00	1,125 00	74 28	53 75	1,199	4	49	12	6	36
Atchison.....	1,000 00	1,400 00	83 00	53 72	1,451	39	37	24	6	36
Atchison County, Effingham	1,000 00	630 00	83 00	51 88	212	4	53	18	6	40
Attica.....	1,200 00	810 00	75 00	50 00	322	8	40	19	6	36
Augusta.....	1,200 00	810 00	70 00	52 00	194	5	39	22	6	36
Axtell.....	1,200 00	810 00	75 50	45 00	96	3	32	7	7	36
Barnard.....	1,200 00	810 00	75 50	45 00	75	2	37	14	6	36
Basehor.....	1,200 00	810 00	75 50	45 00	75	2	37	14	6	36
B.attie.....	1,200 00	810 00	75 50	45 00	75	2	37	14	6	36
Belle Plaine.....	1,200 00	810 00	75 50	45 00	75	2	37	14	6	36
Belleville.....	1,200 00	810 00	75 50	45 00	75	2	37	14	6	36
Bellefonte.....	1,200 00	810 00	75 50	45 00	75	2	37	14	6	36
Belleville.....	1,200 00	810 00	75 50	45 00	75	2	37	14	6	36
Belmont.....	1,200 00	810 00	75 50	45 00	75	2	37	14	6	36
Belpre.....	1,200 00	810 00	75 50	45 00	75	2	37	14	6	36
Bethel Academy, Newton.....	1,200 00	810 00	75 50	45 00	75	2	37	14	6	36
Beverly.....	1,200 00	810 00	75 50	45 00	75	2	37	14	6	36
Blue Mound.....	1,200 00	810 00	75 50	45 00	75	2	37	14	6	36
Blue Rapids.....	1,200 00	810 00	75 50	45 00	75	2	37	14	6	36
Bonner Springs.....	1,200 00	810 00	75 50	45 00	75	2	37	14	6	36
Bronson.....	1,200 00	810 00	75 50	45 00	75	2	37	14	6	36

TABLE II. Salaries—continued.

NAME OF SCHOOL.	Salary of superintendent.....	Salary of principal....	Average salary of assistants.....	Average salary of grade teachers.....	Number of pupils in grades.....	Number of teachers in grades.....	Average number of pupils per teacher in grades.....	Average number of pupils per teacher in high schools.....	Maximum number of classes per teacher..	Number of weeks in school year.....
Brookville.....	.....	\$1,000 00	\$60 00	\$55 00	101	3	11	14	6	36
Bunkerhill.....	.....	900 00	60 00	50 00	107	3	35	11	7	36
Burden.....	.....	1,000 00	60 00	48 75	152	4	38	15	6	36
Burlingame.....	\$1,035 00	595 00	55 00	45 00	403	9	50	23	6	36
Burlington.....	.....	675 00	66 75	51 00	375	10	37	14	6	36
Burr Oak.....	1,100 00	900 00	50 00	50 00	193	4	48	28	8	36
Burrton.....	.....	630 00	55 00	50 00	149	4	37	15	6	36
Caldwell.....	765 00	675 00	60 00	52 77	534	10	53	21	6	36
Caney.....	1,150 00	810 00	70 00	56 25	841	23	36	14	5	36
Canton.....	.....	855 00	60 00	53 33	136	4	34	18	7	36
Carbondale.....	.....	900 00	65 00	42 50	114	4	28	23	7	36
Cawker City.....	.....	630 00	60 00	49 37	188	4	47	15	7	36
Cedar Vale.....	945 00	900 00	60 00	45 00	282	8	35	14	7	32
Centralia.....	.....	900 00	50 00	46 25	151	4	37	29	6	36
Chanute.....	1,350 00	855 00	67 00	55 00	1,713	39	44	29	7	36
Chase County, Cottonwood Falls.....	.....	1,300 00	74 00	.....	638	12	53	18	6	36
Chelsea (Kansas City).....	.....	1,500 00	95 00	58 00	167	4	41	18	6	36
Cheney.....	.....	900 00	62 75	52 50	.....	.....	.....	27	6	36
Cherokee County, Columbus.....	.....	1,500 00	84 17	.....	.....	.....	.....	22	6	36
Cherryvale.....	1,300 00	1,000 00	68 00	53 00	1,147	22	52	22	7	36
Clay County, Clay Center.....	.....	1,500 00	77 00	.....	.....	.....	.....	28	7	36
Clearwater.....	.....	900 00	75 00	55 00	117	3	39	18	7	36
Clifton.....	.....	1,000 00	75 00	47 50	173	4	43	19	7	36
Clyde.....	1,080 00	540 00	60 00	48 33	255	6	42	10	7	36
Coffeyville.....	2,000 00	1,125 00	80 90	57 72	2,749	60	46	22	8	36
Coldwater.....	.....	855 00	57 50	50 00	174	3	58	15	6	36
Colony.....	900 00	540 00	55 00	50 00	126	4	31	22	6	36
Concordia.....	1,600 00	900 00	78 66	53 46	480	13	37	24	7	36

# AFFILIATED SCHOOLS CLASSIFIED.

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Coolidge.....	585 00	60 00	55 00	.....	2	.....	5	7	36
Corning.....	900 00	.....	51 66	146	3	49	24	10	36
Council Grove.....	675 00	62 50	51 36	411	11	37	20	6	36
Crawford County, Cherokee.....	1,320 00	81 66	.....	.....	.....	.....	20	6	36
Cunningham.....	900 00	50 00	50 00	84	3	28	11	6	36
Decatur County, Oberlin.....	1,300 00	80 00	60 00	.....	.....	.....	23	8	36
Delphos.....	1,300 00	55 00	52 00	168	5	33	12	7	36
Derby.....	910 00	50 00	50 00	75	3	25	15	7	36
Dickinson County, Chapman.....	1,300 00	37 00	.....	.....	.....	.....	22	7	36
Dixon Township, Argonia.....	810 00	60 00	.....	.....	.....	.....	17	6	36
Dodge City.....	1,000 00	78 33	58 00	601	13	46	21	7	36
Douglas.....	1,000 00	70 00	49 00	184	5	37	21	6	36
Downs.....	675 00	70 00	52 50	359	8	44	21	5	36
Easton.....	720 00	60 00	40 00	116	3	38	17	7	36
Edwardsville.....	900 00	65 00	48 33	65	3	21	4	8	36
El Dorado.....	900 00	79 00	55 00	483	14	34	20	6	36
Ellinwood.....	810 00	58 75	58 75	172	4	43	17	8	36
Ellis.....	675 00	75 00	57 50	.....	5	.....	10	6	36
Ellsworth.....	810 00	67 50	57 50	344	9	38	15	6	36
Elwood.....	990 00	65 00	48 33	.....	6	.....	7	6	36
Emporia.....	1,350 00	83 00	60 54	1,562	37	42	25	6	36
Enterprise.....	810 00	60 00	48 30	217	6	36	21	8	36
Enterprise Academy.....	850 00	30 00	.....	.....	.....	.....	7	7	36
Erie.....	1,000 00	65 00	57 00	.....	.....	.....	18	7	36
Esbridge.....	675 00	70 00	62 50	134	4	33	18	6	36
Eudora.....	810 00	65 00	51 25	149	4	37	15	6	36
Eureka.....	720 00	66 25	46 00	509	11	46	17	6	36
Everest.....	765 00	.....	56 00	116	3	39	20	12	36
Florence.....	1,000 00	55 00	48 92	334	7	47	14	6	36
Fort Scott.....	1,250 00	76 40	58 50	1,703	42	40	19	6	36
Frankfort.....	720 00	65 00	50 00	1,337	7	48	25	6	36
Frankford.....	1,300 00	70 00	51 25	641	12	53	19	6	36
Fredonia.....	1,000 00	69 00	51 00	641	28	43	23	7	36
Galena.....	1,500 00	81 00	55 96	1,227	14	43	16	6	36
Garden City.....	1,350 00	75 00	50 00	600	4	39	30	7	32
Gardner.....	680 00	75 00	50 00	157	4	39	30	7	32
Garfield.....	700 00	60 00	.....	.....	2	.....	5	8	36
Garnett.....	675 00	66 00	55 00	480	11	39	24	6	36
Gas City.....	630 00	66 00	49 10	420	12	35	5	6	36
Geneseo.....	720 00	47 50	52 83	133	3	44	9	6	36
Girard.....	585 00	50 00	44 60	552	12	46	24	6	36
Glascow.....	800 00	60 00	.....	192	4	48	24	7	32
Glen Elder.....	585 00	55 00	50 00	122	4	30	10	8	36
Gray County, Cimarron.....	1,000 00	75 00	.....	.....	.....	.....	18	7	36
Great Bend.....	900 00	75 00	56 00	711	15	47	19	6	36

TABLE II. Salaries—continued.

NAME OF SCHOOL.	Salary of superin- tendent.....	Salary of principal....	Average salary of assistants.....	Average salary of grade teachers.....	Number of pupils in grades.....	Number of teachers in grades.....	Average number of pupils per teacher in grades.....	Average number of pupils per teacher in high schools.....	Maximum number of classes per teacher..	Number of weeks in school year.....	
Greeley County, Tribune.....		\$855 00								36	
Greenleaf.....	\$1,000 00	510 00	\$55 00	\$45 00	195	5	39	19	8	36	
Gypsum.....		900 00	30 00	52 50	153	4	38	17	6	36	
Haddam.....		560 00		55 00	91	3	30	20	7	32	
Halstead.....	1,125 00	810 00	68 00	56 00	179	4	44	14	6	36	
Harper.....	1,200 00	810 00	55 00	49 00	327	8	40	18	6	36	
Hartford.....		900 00	70 00	51 00	110	5	22	19	6	36	
Harveyville.....		480 00	60 00	50 00	117	3	39	6	6	32	
Havensville.....	800 00	787 50	64 00	52 50	136	4	34	14	6	35	
Hays.....		630 00	55 00	52 50	225	5	45	15	6	36	
Herington.....	1,200 00	810 00	75 00	52 00	566	13	43	19	6	36	
Hiawatha.....	1,350 00	810 00	65 00	52 00	518	16	32	18	6	36	
Hiattville.....	1,300 00	540 00	42 50	43 75	38	1	38	16		32	
Hill City.....		607 50	60 00	50 00	220	4	55	19	6	36	
Hillsboro.....	810 00	800 00	60 00	50 00	248	7	35	8	7	36	
Hoisington.....	1,125 00	675 00	60 00	50 55	358	9	39	22	7	36	
Holton.....	1,320 00	1,000 00	65 00	53 00	535	14	38	19	6	36	
Horton.....	1,200 00	600 00	60 00	46 88	698	16	43	28	6	32	
Howard.....	1,150 00	675 00	60 00		238	6	39	19	7	36	
Humboldt.....	1,200 00	810 00	80 00	54 00	503	9	55	19	6	36	
Hutchinson.....	2,000 00	1,000 00	82 50	60 96	2,154	52	41	27	7	36	
Iola.....	2,000 00	1,350 00	77 50	56 35	2,243	47	47	30	6	36	
Irving.....	810 00	540 00	50 00	50 00				14	6	36	
Jewell City.....		990 00	62 00	47 50	201	4	50	17	6	36	
Junction City.....	1,800 00	1,100 00	80 00	59 16	1,149	24	47	24	6	36	
Kansas City.....	2,700 00	2,400 00	99 35	68 51	9,972	208	46	20	6	36	
Kincaid.....		900 00	75 00	50 00	107	3	36	24	7	36	
Kingman.....	1,200 00	900 00	75 00	52 00	475	11	43	27	6	36	

Kinsley.....	1,200 00	71 66	56 56	398	8	49	22	5	36
Kiowa.....	1,200 00	60 00	50 31	340	8	42	18	6	36
Kiowa County, Greensburg	1,000 00	60 00	.....	.....	.....	.....	18	8	36
Lafayette County, Altamont	1,200 00	65 00	.....	.....	.....	.....	22	6	38
La Crosse.....	720 00	65 00	50 00	155	4	38	20	7	32
La Cygne.....	585 00	60 00	44 87	249	6	41	17	7	36
La Harpe.....	720 00	70 00	50 00	484	13	37	17	7	36
Lane County, Dighton.....	900 00	55 00	.....	.....	.....	.....	19	7	36
Lansing.....	675 00	60 00	82 50	177	4	44	17	6	36
Larned.....	1,100 00	62 50	54 00	564	12	47	27	7	36
Larned.....	1,100 00	62 50	54 00	564	12	47	27	7	36
Lawrence.....	1,700 00	73 62	53 93	1,879	42	44	30	6	36
Leavenworth.....	1,350 00	91 00	60 54	2,710	61	44	24	6	36
Lebanon.....	990 00	75 00	52 50	182	4	45	30	7	36
Lebo.....	540 00	70 00	50 00	130	4	32	12	7	36
Lecompton.....	720 00	60 00	47 50	.....	3	.....	.....	5	36
Leon.....	950 00	100 00	49 00	117	4	29	19	7	36
Leoti.....	90 00	75 00	55 00	102	3	34	8	6	36
Le Roy.....	585 00	60 00	53 75	174	4	43	20	7	36
Lewis.....	832 00	65 00	51 25	181	4	32	12	7	36
Liberal.....	1,000 00	60 00	54 37	356	8	44	17	6	36
Lincoln.....	1,125 00	720 00	48 25	314	11	28	19	7	36
Lindsborg.....	1,200 00	55 00	50 00	214	8	26	15	6	36
Linwood.....	540 00	55 00	50 00	84	4	21	13	5	36
Little River.....	675 00	65 00	52 50	166	4	41	14	6	36
Logan.....	900 00	75 00	51 00	201	4	50	23	7	36
Louisville.....	765 00	45 00	45 00	94	3	31	18	12	35
Lucas.....	720 00	50 00	53 33	153	4	38	6	8	36
Lyndon.....	594 00	45 00	45 00	161	4	40	26	7	36
Lyons.....	810 00	73 33	48 50	373	10	37	20	6	36
Mankato.....	675 00	62 50	50 00	268	6	44	25	6	36
Maplehill.....	900 00	65 00	55 00	111	2	55	6	6	36
Marion.....	1,000 00	70 00	60 00	374	9	41	11	6	36
Marquette.....	900 00	65 00	55 00	190	4	47	15	7	36
Marquette.....	855 00	65 00	50 00	266	9	29	21	6	36
McLouth.....	999 00	70 00	46 85	133	4	33	13	6	36
McPherson.....	900 00	72 50	52 00	673	16	42	25	5	36
Medicine Lodge.....	580 00	62 50	51 80	325	7	46	20	5	36
Meriden.....	675 00	75 00	50 00	117	4	29	17	7	36
Minneapolis.....	810 00	70 00	53 00	343	9	38	15	6	36
Moline.....	950 00	70 00	47 50	194	5	38	13	8	36
Montgomery County, Independence	2,000 00	102 22	.....	.....	.....	.....	32	5	36
Moran.....	585 00	60 00	50 00	126	4	31	22	5	36
Mound City.....	900 00	60 00	52 00	138	4	34	22	6	36
Mount Hope.....	900 00	65 00	60 00	.....	3	.....	22	7	36

TABLE II. Salaries—continued.

NAME OF SCHOOL.	Salary of superin- tendent.....	Salary of principal...	Average salary of assistants.....	Average salary of grade teachers.....	Number of pupils in grades.....	Number of teachers in grades.....	Average number of pupils per teacher in grades.....	Average number of pupils per teacher in high schools.....	Maximum number of classes per teacher..	Number of weeks in school year.....
Moundridge.....	.....	\$810 00	\$75 00	\$46 00	152	4	38	16	.....	32
Natoma.....	.....	810 00	70 00	46 66	88	4	22	8	.....	36
Nazareth Academy, Concordia.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	38
Neodesha.....	.....	765 00	75 00	51 50	634	18	40	13	6	36
Ness City.....	\$1,200 00	1,000 00	72 50	54 00	148	4	37	22	6	36
Newton.....	.....	1,125 00	70 00	56 30	1,115	27	41	23	6	36
Norton County, Norton.....	.....	1,320 00	80 00	.....	.....	.....	.....	27	7	36
Nortonville.....	.....	1,000 00	60 00	48 75	139	4	34	22	7	36
Norwich.....	.....	999 00	60 00	52 50	161	4	40	11	8	36
Oakley.....	.....	720 00	70 00	55 00	166	4	41	20	6	36
Olathe.....	1,125 00	810 00	65 00	52 50	536	16	33	22	6	36
Onaga.....	1,300 00	562 50	60 00	55 00	170	4	42	15	6	36
Osage.....	900 00	765 00	70 00	43 83	575	15	38	15	6	36
Osage City.....	.....	720 00	55 00	38 08	505	13	38	21	6	36
Osawatimie.....	1,125 00	.....	.....	.....	.....	.....	.....	.....	.....	36
Osborne.....	.....	1,350 00	75 00	51 87	275	8	34	26	6	36
Oskaloosa.....	1,000 00	595 00	67 50	50 00	177	4	44	16	5	36
Oswego.....	800 00	560 00	60 00	45 00	375	10	37	24	6	32
Ottawa.....	1,700 00	1,000 00	75 50	58 66	1,265	30	42	19	6	36
Overbrook.....	.....	810 00	50 00	45 00	120	3	40	25	7	36
paola.....	1,200 00	1,100 00	75 00	55 00	441	15	29	19	6	36
parsons.....	1,800 00	1,125 00	84 00	58 40	1,946	39	49	21	6	36
peabody.....	1,152 00	675 00	65 00	50 00	263	8	33	17	6	36
Perry.....	810 00	560 00	70 00	50 00	97	4	24	13	6	36
Phillipsburg.....	1,000 00	630 00	65 00	52 50	316	8	39	18	6	36
Pittsburg.....	2,100 00	1,500 00	74 00	53 00	2,798	48	58	38	7	36
Plainville.....	900 00	585 00	55 00	55 00	232	6	39	13	5	36
Pleasanton.....	1,000 00	540 00	65 00	52 00	263	6	43	25	6	36
Portis.....	.....	900 00	70 00	50 00	101	4	25	15	6	36

Pratt.....	1,250 00	89 50	58 00	563	14	40	22	36
Rawlins County, Atwood.....	1,080 00	71 65	58 33	99	3	33	17	36
Reading.....	680 00	55 00	45 00	75	2	37	7	36
Redfield.....	675 00	50 00	91 25				7	36
Ren County, Nickerson.....	1,800 00						7	40
Richmond.....	1,765 00						10	36
Rosedale.....	855 00	70 00	50 00	92	3	30	33	36
Rose Hill.....	900 00	72 50	55 00	1,187	26	45	7	36
Rossville.....	600 00		50 00	115	3	38	6	36
Russell.....	1,100 00	65 00	60 00	182	4	33	10	36
Sabetha.....	1,250 00	65 00	55 00	321	8	40	33	36
Salina.....	1,900 00	87 50	57 41	390	9	43	25	36
St. John.....	1,350 00	75 00	60 00	1,318	36	36	7	36
Savonburg.....	1,200 00	55 00	52 50	1,325	9	36	6	36
Scott County, Scott.....	720 00	55 00		67	2	33	5	36
Scranton.....	810 00	55 00					24	36
Sedan.....	900 00	50 00	35 63		2		8	36
Sedgwick.....	900 00	65 00	45 00	380	8	47	6	36
Seneca.....	1,300 00	65 00	55 00	152	5	30	6	36
Sharon Springs.....	720 00	70 00	48 00	288	9	32	23	36
Sheridan County, Hoxie.....	765 00	70 00	56 00	92	3	30	6	36
Sherman County, Goodland.....	1,200 00	87 50					18	36
Smith Center.....	1,150 00	75 00	45 00	339	8	42	12	36
Solomon.....	765 00	62 50	50 00	309	9	34	12	36
Southern Kansas Academy, Eureka.....	540 00	53 00	46 75	250	7	35	25	36
Spring Hill.....	1,000 00	65 00					12	36
Stafford.....	900 00	65 00	50 00	105	3	35	5	36
Sterling.....	765 00	73 75	57 77	351	9	39	19	36
Stockton.....	810 00	76 00	60 00	424	9	47	20	36
St. Marys.....	630 00	62 50	47 15	230	8	28	25	36
St. Mary's Academy, Leavenworth.....	900 00	60 00	51 00	207	6	34	18	36
Summerfield.....	810 00	60 00	45 00				14	36
Sumner (Kansas City).....	1,500 00	99 00	68 00	130	4	32	5	36
Sumner County, Wellington.....	1,600 00	90 00		10,650	210	50	19	36
Sylvan Grove.....	720 00	50 00	54 00				15	36
Syracuse.....	765 00	60 00	53 75	76	3	25	7	36
Thomas County, Colby.....	1,200 00	80 00		184	8	23	9	36
Tonganoxie.....	585 00	58 75	51 66				15	36
Topeka.....	1,800 00	92 87	66 03	229	6	38	16	36
Trego County, Wa Keeney.....	1,500 00	78 33		5,421	176	30	26	36
Troy.....	720 00	65 00	48 75				6	36
Valley Center.....	900 00	75 00	53 33	202	6	33	17	36
Valley Falls.....	675 00	63 33	52 07	35	3	31	20	36
Vermilion.....	810 00	60 00	40 00	214	6	35	15	36
				94	3	31	6	36

TABLE II. Salaries—concluded.

NAME OF SCHOOL.	Salary of superin- tendent.....	Salary of principal....	Average salary of assistants.....	Average salary of grade teachers.....	Number of pupils in grades.....	Number of teachers in grades.....	Average number of pupils per teacher in grades.....	Average number of pupils per teacher in high schools.....	Maximum number of classes per teacher..	Number of weeks in school year.....	
Walden Academy, McPherson.....	\$1,200 00	\$810 00	\$70 00	\$51 00	268	8	5	36	8	36	
Wamego.....	1,200 00	720 00	65 00	49 50	314	8	27	36	7	36	
Washington.....	1,200 00	810 00	60 00	55 00	155	4	27	36	6	36	
Waterville.....	1,045 00	585 00	60 00	55 00	225	4	21	36	6	36	
Wathena.....	900 00	1,000 00	65 19	46 00	225	5	12	36	5	36	
Waverly.....		1,000 00	70 00	51 25	154	4	22	36	6	36	
Wellsville.....		720 00	60 00	50 00	163	4	23	36	6	36	
Westmoreland.....		765 00	60 00	45 00	140	4	40	36	7	36	
Wetmore.....	1,000 00	585 00	55 00	52 50	146	4	18	36	7	36	
White City.....		855 00	60 00	52 75	176	4	16	36	6	36	
White Cloud.....		945 00	60 00	50 00	163	3	19	36	7	36	
Wichita.....	2,500 00	2,000 00	97 70	68 00	6,542	145	13	36	8	36	
Williamsburg.....		700 00	50 00	45 00	142	4	31	36	6	36	
Wilson.....	900 00	585 00	55 00	48 00	207	5	35	32	8	32	
Winchester.....		1,000 00	60 00	51 25	134	4	41	36	8	36	
Winfield.....	1,800 00	1,260 00	70 00	52 80	1,200	25	15	36	6	36	
Yates Center.....	1,080 00	675 00	75 50	50 00	311	10	27	36	6	36	

NAME OF SCHOOL.

The purpose of this table is to give a comparative view of salaries in the various departments of high-school work. It also contains figures for comparing the average number of pupils per teacher in the high school and grades, the maximum number of classes per teacher, and also the number of weeks in the school year. In each case where there are only two teachers in the high school, one is designated as principal and the other as the assistant.

Nothing startling is revealed by comparison of figures or summaries in this table. It is gratifying to note that the average salary of assistants in the high school is increasing, although the amount of increase is only about one dollar per month. In the year 1907-'08 the average salary for assistants in the high school was \$64.27 per month; for this year the average is \$65.15 per month. The average salary of high-school principals in 259 schools is \$865.11 per year, and the average salary for superintendents in 138 schools is \$1254 25. The average salary for teachers in the grades is \$51.55 per month. On the whole salaries have increased. Two superintendents in the state receive the small salary of \$765 per year; the highest salary is \$2750 per year. The highest salary paid to high-school principal is \$2400; the lowest salary for high-school principal is \$450. Fifteen cities of the state pay their superintendents \$1800 or more per year.

It is also gratifying to note that fewer teachers are required to carry as many as seven recitations per day. Practically all of the schools have come within the maximum of six recitations per day, and a larger number than ever before are requiring only five periods of all of their English and science instructors.

Of the 262 schools only seventeen have as few as thirty-two weeks in the year, which is only 6.4 per cent. All others have thirty-five weeks or more, and an increased number over last year have extended their terms to thirty-eight or forty weeks. The lowest salary paid high-school teachers is \$50 per month. Twelve schools have reached this minimum during the present year.

TABLE III. Equipment.

NAME OF SCHOOL.	Reference books, volumes.....	General reading ....	Maps and charts....	Number volumes added last year....	Physics, value.....	Chemistry, value ...	Botany, value.....	Zoology, value.....
Abilene.....	75	800	11	15	\$200 00	\$200 00	\$100 00	.....
Agua.....	25	200	3	0	40 00	.....	35 00	.....
Alden.....	60	90	4	0	170 00	.....	75 00	.....
Alma.....	170	300	0	350	200 00	.....	200 00	.....
Almena.....	50	400	2	50	250 00	.....	60 00	.....
Alta Vista.....	20	102	13	0	160 00	.....	75 00	.....
Altoona.....	100	100	3	85	200 00	.....	65 00	.....
Anthony.....	100	200	3	0	130 00	.....	75 00	.....
Argentine.....	175	125	8	80	250 00	250 00	75 00	.....
Arkansas City.....	125	0	8	15	175 00	150 00	.....	.....
Ashland.....	40	400	4	100	125 00	.....	75 00	.....
Atchison.....	85	285	11	0	400 00	.....	125 00	.....
Atchinson County, Effingham.....	400	2,400	25	150	300 00	125 00	.....	.....
Attica.....	130	200	4	0	125 00	.....	.....	.....
Augusta.....	200	500	18	1	400 00	.....	100 00	\$50 00
Axtell.....	200	400	39	100	175 00	.....	75 00	.....
Barnard.....	16	0	0	16	100 00	.....	35 00	.....
Basehor.....	75	200	2	40	100 00	.....	40 00	.....
Beattie.....	25	275	0	10	26 00	.....	60 00	.....
Belle Plaine.....	300	300	3	0	200 00	.....	75 00	.....
Belleville.....	125	400	5	25	275 00	.....	210 00	.....
Beloit.....	1,641	937	22	200	500 00	.....	36 00	.....
Belpre.....	40	130	8	65	.....	.....	75 00	.....
Bethel Academy, Newton.....	400	1,200	24	150	275 00	150 00	36 00	36 00
Beverly.....	5	10	0	0	.....	.....	75 00	.....
Blue Mound.....	30	50	7	0	230 00	.....	40 00	.....
Blue Rapids.....	100	40	66	15	300 00	.....	100 00	.....
Bonner Springs.....	60	200	1	40	200 00	50 00	25 00	.....
Bronson.....	50	250	0	.....	200 00	.....	40 00	.....
Brookville.....	100	400	14	20	250 00	25 00	20 00	.....

Bunkerhill.....	60	265	0	125	150 00	50 00	.....
Burden.....	82	336	1	42	145 00	43 00	.....
Burlingame.....	500	200	15	50	250 00	25 00	25 00
Burlington.....	159	151	20	75	250 00	70 00	.....
Burr Oak.....	30	250	3	20	60 00	60 00	.....
Burton.....	85	635	0	40	120 00	100 00	.....
Caldwell.....	300	500	16	50	300 00	50 00	.....
Caney.....	30	125	0	10	200 00	50 00	.....
Canton.....	80	150	6	8	200 00	25 00	.....
Carbondale.....	50	50	25	0	100 00	25 00	.....
Cawker City.....	33	144	112	0	200 00	75 00	.....
Cedar Vale.....	50	50	0	0	50 00	40 00	.....
Centralia.....	100	80	1	0	100 00	80 00	.....
Chanute.....	200	100	0	30	200 00	200 00	.....
Chase County, Cottonwood Falls.....	150	568	9	0	200 00	175 00	.....
Chelsea (Kansas City).....	2,000	1,500	5	90	250 00	100 00	.....
Cheney.....	220	400	18	54	277 00	80 00	.....
Cherokee County, Columbus.....	1,000	40	15	65	700 00	254 00	.....
Cherryvale.....	100	400	5	200	250 00	300 00	.....
Clay County, Clay Center.....	400	500	9	67	350 00	300 00	.....
Clearwater.....	110	130	38	40	209 00	100 00	.....
Clifton.....	100	350	20	50	110 00	50 00	.....
Clyde.....	200	800	10	0	150 00	45 00	.....
Coffeyville.....	110	3,561	10	600	300 00	500 00	.....
Coldwater.....	67	136	4	66	100 00	75 00	.....
Colony.....	90	210	3	10	15 00	50 00	.....
Concordia.....	250	500	3	25	1,000 00	600 00	.....
Coolidge.....	.....	.....	.....	.....	50 00	50 00	.....
Corning.....	12	0	0	0	25 00	.....	.....
Council Grove.....	75	450	9	30	225 00	40 00	.....
Crawford County, Cherokee.....	250	100	11	50	350 00	200 00	.....
Cunningham.....	10	150	65	84	106 00	.....	.....
Decatur County, Oberlin.....	170	326	5	20	275 00	10 00	.....
Delphos.....	150	200	13	50	250 00	50 00	.....
Derby.....	34	50	0	0	.....	50 00	.....
Dickinson County, Chapman.....	500	3,000	400	0	200 00	50 00	.....
Dixon Township, Argonia.....	100	300	1	0	300 00	150 00	.....
Dodge City.....	212	300	7	50	300 00	50 00	.....
Douglas.....	50	100	8	20	200 00	32 00	.....
Downs.....	50	80	4	15	300 00	100 00	.....
Easton.....	20	130	6	40	100 00	15 00	.....
Edwardsville.....	75	525	3	0	90 00	.....	.....
El Dorado.....	800	200	4	0	400 00	160 00	.....
Ellinwood.....	87	183	2	9	125 00	60 00	.....

TABLE III. Equipment—continued.

NAME OF SCHOOL.	Reference books, volumes.....	General reading ....	Maps and charts....	Number volumes added last year...	Physics, value.....	Chemistry, value....	Botany, value.....	Zoology, value.....
Ellis.....	48	61	46	.....	\$200 00	.....	.....	.....
Ellsworth .....	420	300	23	45	225 00	\$225 00	.....	.....
Elwood .....	136	258	5	52	165 00	20 00	.....	.....
Emporia.....	225	600	5	50	350 00	300 00	.....	.....
Enterprise.....	.....	.....	.....	.....	845 00	20 00	.....	.....
Enterprise Normal Academy.....	400	500	4	150	80 00	150 00	.....	.....
Erie.....	110	390	3	45	50 00	50 00	.....	\$50 00
Eskridge.....	200	400	6	500	150 00	35 00	.....	.....
Eudora.....	230	300	6	30	95 00	30 00	.....	.....
Eureka.....	44	350	3	95	250 00	100 00	.....	50 00
Everest.....	150	150	9	0	50 00	50 00	.....	.....
Florence.....	500	1,000	0	100	100 00	10 00	.....	.....
Fort Scott.....	500	3,161	5	128	1,000 00	50 00	.....	.....
Frankfort.....	150	450	0	40	150 00	300 00	.....	.....
Fredonia .....	55	160	1	125	300 00	250 00	.....	.....
Galena .....	250	150	50	0	100 00	400 00	.....	.....
Garden City.....	380	100	4	0	260 00	75 00	.....	.....
Gardner.....	0	83	4	0	90 00	.....	.....	.....
Garfield .....	50	75	7	0	.....	10 00	.....	.....
Garnett.....	220	250	5	30	175 00	10 00	.....	.....
Gas City.....	50	425	125	100	225 00	40 00	.....	.....
Geneseo .....	25	75	14	0	110 00	25 00	.....	.....
Girard.....	50	221	6	0	150 00	25 00	.....	.....
Glasco.....	75	200	15	8	125 00	45 00	.....	.....
Glen Elder.....	85	450	11	10	160 00	20 00	.....	.....
Gray County, Cimarron.....	160	42	0	130	125 00	25 00	.....	.....
Great Bend.....	200	0	4	0	200 00	50 00	.....	.....
Greenlee County, Tribune.....	0	0	0	0	.....	100 00	.....	.....
Greenleaf .....	400	200	310	80	100 00	25 00	.....	.....
Gypsum.....	35	175	0	10	.....	50 00	.....	.....

	30	70	0	225 00	90 00	75 00	185 00
Haddam.....	380	275	0	225 00	90 00	75 00	185 00
Halstead.....	150	200	225	150 00	75 00	35 00	15 00
Harper.....	225	35	12	65 00		70 00	
Harford.....	190	0	5	115 00		40 00	
Harveyville.....	150	310	4	210 00		70 00	
Havensville.....	175	200	10	35 200 00		175 00	
Hays.....	238	140	156	170 00		30 00	
Herington.....	440	0	18	640 00	155 80	185 00	
Hiawatha.....	32	223	7	70 00		50 00	
Hiattville.....	428		2	40 00		50 00	
Hillsboro.....	754	201	14	275 00		100 00	
Hoisington.....	200	600	38	200 00	200 00	200 00	
Horton.....	200	800	2	150 00		50 00	
Howard.....	963		7	200 00		40 00	
Howard.....	400		10	250 00		100 00	
Humboldt.....	200	600	21	800 00	250 00	150 00	
Hutchinson.....	1,100	0	15	300 00	200 00	200 00	
Iola.....	65	170	2	150 00		50 00	
Irving.....	500	500	0	100 00		30 00	
Jewell City.....	1,000	0	11	300 00		150 00	
Junction City.....	150	850	6	1,650 00	1,200 00	1,150 00	
Kansas City.....	75	175	12	100 00		50 00	
Kincaid.....	100	500	0	200 00		150 00	
Kingman.....	150	1,080	7	180 00	80 00	85 00	
Kinsley.....	250	600	12	270 00		100 00	
Kiowa.....	35	60	0	80 00		50 00	
Kiowa County, Greensburg	200	600	11	300 00		20 00	
Labette County, Altamont.....	50	200	1	45 00		75 00	
La Crosse.....	500			150 00		75 00	
La Cygne.....	240	450	1	170 00			
La Harpe.....	200	200	4	450 00		100 00	
Lane County, Dighton.....	300	700	7	200 00		60 00	
Lansing.....	1,342			975 00	450 00	200 00	
Larned.....	1,232	700	6	600 00	900 00	150 00	
Lawrence.....	18	168	0	125 00		50 00	
Leavenworth.....	50	50		25 00		35 00	
Lebanon.....	150	75	3	200 00		50 00	
Lebo.....	300	200	12	165 00		30 00	
Lecompton.....	21	125	0	80 00		90 00	
Leon.....	40	800	19				
Leoti.....	53	45	4				
Le Roy.....							
Lewis.....							

TABLE III. Equipment — continued.

NAME OF SCHOOL.	Reference books, volumes.....	General reading ....	Maps and charts....	Number volumes added last year ...	Physics, value.....	Chemistry, value ...	Botany, value.....	Zoology, value.....
Liberal.....	117	28	1	50	.....	.....	.....	.....
Lincoln.....	200	400	6	35	\$200 00	\$100 00	\$50 00	.....
Lindsborg.....	200	200	11	23	250 00	.....	32 00	.....
Linwood.....	100	100	0	35	150 00	.....	75 00	.....
Little River.....	65	145	2	23	175 00	.....	50 00	.....
Logan.....	131	88	7	65	115 75	.....	75 00	.....
Louisville.....	100	400	75	50	.....	.....	67 00	.....
Lucas.....	35	75	0	0	75 00	25 00	50 00	.....
Lyndon.....	200	350	1	0	150 00	.....	100 00	.....
Lyons.....	300	400	14	100	210 00	.....	75 00	.....
Mankato.....	400	100	16	50	250 00	150 00	.....	.....
Maplehill.....	100	150	0	0	.....	.....	.....	.....
Marion.....	350	300	5	38	200 00	.....	130 00	.....
Marquette.....	109	220	19	10	.....	.....	60 00	.....
Marysville.....	150	1,000	35	0	300 00	.....	50 00	.....
McLouth.....	66	101	6	49	120 00	.....	70 00	.....
McPherson.....	300	100	0	50	150 00	.....	150 00	.....
Medicine Lodge.....	400	2,000	6	150	250 00	.....	180 00	.....
Meriden.....	78	231	0	77	.....	.....	45 00	.....
Minneapolis.....	300	900	25	70	250 00	.....	75 00	\$25 00
Moline.....	64	510	24	12	250 00	.....	75 00	125 00
Montgomery County, Independence.....	1,000	1,000	7	100	900 00	800 00	150 00	150 00
Moran.....	100	275	26	30	875 00	.....	10 00	.....
Mound City.....	400	50	0	50	150 00	.....	40 00	.....
Mount Hope.....	800	204	5	0	130 00	.....	40 00	.....
Moundridge.....	40	204	20	2	100 00	10 00	30 00	.....
Natoma.....	47	85	0	0	.....	.....	36 00	.....
Nazareth Academy, Concordia.....	300	600	4	50	200 00	500 00	.....	.....
Neodesha.....	200	400	5	100	200 00	.....	50 00	.....
Ness City.....	120	500	7	75	35 00	.....	75 00	.....

Newton.....	500	4	25	\$25 00	100 00	75 00	.....
Norton County, Norton.....	400	4	250	180 00	300 00	200 00	.....
Nortonville.....	80	5	25	160 00	100 00	125 00	.....
Norwich.....	68	0	11	225 00	.....	50 00	.....
Oakley.....	205	1	278	250 00	.....	50 00	.....
Olathe.....	500	12	150	250 00	.....	75 00	.....
Onaga.....	100	3	500	200 00	150 00	125 00	.....
Osage City.....	225	3	225	275 00	.....	100 00	.....
Osawatimie.....	50	10	80	192 50	62 50	54 00	.....
Osborne.....	50	5	60	300 00	.....	75 00	.....
Oskaloosa.....	100	7	130	300 00	.....	125 00	.....
Oswego.....	75	0	0	100 00	25 00	.....	.....
Ottawa.....	600	8	100	600 00	500 00	400 00	.....
Overbrook.....	42	3	36	140 00	.....	35 00	.....
Paola.....	80	3	445	500 00	650 00	200 00	.....
Parsons.....	83	5	250	250 00	250 00	150 00	.....
Peabody.....	150	2	0	200 00	.....	50 00	.....
Perry.....	6	0	0	300 00	.....	15 00	.....
Phillipsburg.....	45	18	12	140 00	.....	.....	.....
Pittsburg.....	360	0	75	400 00	500 00	160 00	.....
Plainville.....	200	2	0	100 00	.....	10 00	.....
Pleasanton.....	85	3	0	130 00	20 00	75 00	.....
Portis.....	57	2	0	105 00	.....	38 50	.....
Pratt.....	500	12	50	400 00	400 00	250 00	.....
Rawlins County, Atwood.....	150	3	27	155 00	.....	47 00	.....
Reading.....	150	18	25	100 00	.....	5 00	.....
Redfield.....	30	1	20	.....	.....	.....	.....
Reno County, Nickerson.....	500	8	290	1,000 00	150 00	300 00	.....
Richmond.....	75	0	0	.....	.....	30 00	.....
Rosedale.....	101	0	154	250 00	.....	125 00	.....
Rose Hill.....	370	17	300	230 00	.....	66 00	.....
Rossville.....	1,200	10	0	.....	.....	60 00	.....
Russell.....	350	3	40	240 00	.....	70 00	.....
Sabetha.....	270	14	66	350 00	.....	75 00	.....
Salina.....	35	7	10	750 00	200 00	350 00	.....
St. John.....	500	72	400	300 00	.....	175 00	.....
Savonburg.....	11	0	0	100 00	.....	15 00	.....
Scott County, Scott.....	150	4	.....	200 00	.....	25 00	.....
Seranton.....	100	1	44	130 00	.....	18 00	.....
Sedan.....	364	8	108	250 00	.....	50 00	.....
Sedgwick.....	200	9	0	125 00	110 00	35 00	.....
Seneca.....	140	6	10	150 00	50 00	120 00	.....
Sharon Springs.....	100	5	150	74 00	.....	10 00	.....
Sheridan County, Hoxie.....	100	15	50	160 00	.....	175 00	.....

TABLE III. Equipment—concluded.

NAME OF SCHOOL.	Reference books, volumes.....	General reading ....	Maps and charts....	Number volumes added last year...	Physics, value.....	Chemistry, value...	Botany, value.....	Zoology, value.....
Sherman County, Goodland	100	200	18	0	\$100 00	.....	.....	.....
Smith Center.....	300	200	5	10	225 00	\$200 00	\$50 00	.....
Southern Kansas Academy, Eureka.	.....	.....	.....	.....	.....	.....	.....	\$500 00
Solomon.....	150	300	2	100	250 00	.....	100 00	.....
Spring Hill.....	75	150	2	20	200 00	.....	40 00	.....
Stafford.....	300	25	3	100	475 00	.....	150 00	.....
Sterling.....	800	800	25	50	150 00	.....	.....	.....
Stockton.....	94	75	128	156	200 00	.....	75 00	.....
St. Mary's.....	51	53	4	33	100 00	.....	.....	.....
St. Mary's Academy, Leavenworth.	872	4,280	19	222	500 00	310 00	.....	.....
Summerfield.....	.....	113	0	0	50 00	.....	25 00	.....
Sumner (Kansas City).....	.....	.....	13	.....	300 00	750 00	50 00	.....
Sumner County, Wellington.	415	1,085	310	85	500 00	300 00	250 00	300 00
Sylvan Grove.....	.....	200	3	20	90 00	.....	10 00	.....
Syracuse.....	350	415	0	0	100 00	.....	20 00	.....
Thomas County, Colby	160	500	4	30	500 00	100 00	200 00	.....
Tonganoxie.....	100	250	4	50	200 00	.....	100 00	.....
Topeka.....	.....	600	0	0	1,500 00	750 00	1,080 00	.....
Trego County, Wa Keeney	100	500	15	100	300 00	.....	180 00	.....
Troy.....	25	275	1	25	160 00	.....	100 00	.....
Valley Center.....	100	115	8	75	.....	.....	40 00	40 00
Valley Falls.....	400	1,600	1	116	185 00	.....	15 00	.....
Vermilion.....	60	190	10	0	75 00	.....	90 00	.....
Walden College, McPherson.	290	580	8	30	85 00	.....	20 00	.....
Wamego.....	150	500	12	0	275 00	.....	100 00	.....
Washington.....	280	350	2	0	150 00	250 00	.....	.....
Waterville.....	100	175	0	25	100 00	.....	20 00	.....
Wathena.....	173	125	12	43	175 00	.....	50 00	.....
Waverly.....	50	450	18	0	250 00	.....	25 00	.....
Wellsville.....	90	270	0	25	75 00	.....	.....	.....

Westmoreland.....	44	210	4	2	100 00	.....	30 00	.....
Wetmore.....	100	1,050	18	100	500 00	.....	75 00	.....
White City.....	25	40	2	18	125 00	.....	15 00	.....
White Cloud.....	200	300	9	65	90 00	.....	50 00	.....
Wichita.....	341	967	136	92	1,200 00	800 00	700 00	200 00
Williamsburg.....	50	100	37	0	.....	.....	.....	.....
Wilson.....	200	460	2	0	125 00	.....	30 00	30 00
Winchester.....	122	400	0	200	.....	.....	50 00	.....
Winfield.....	2,100	900	12	300	300 00	.....	125 00	.....
Yates Center.....	500	500	6	0	200 00	.....	50 00	.....

The purpose of this table is to show in condensed form the number of volumes in the libraries and the relative values of the laboratory equipment in physics, chemistry, botany and zoölogy. Practically all schools accredited in the first and second classes have sufficient laboratory facilities to give a credit course in either a physical or biological science. These equipments range in value from \$25 up to \$1650. The average for the 262 schools is \$217 per school. When we consider that two-thirds of these schools have been equipped within the last five years we cannot refrain from commending the energy with which this important department of secondary education has been pushed forward.

Another very significant fact bearing upon the general interest in this subject is indicated from the additions made to the school libraries during the past year. An accurate report shows that there were added last year to the high-school libraries of the state 15,341 volumes. A number of the smaller schools are yet without working libraries, but school boards and school managements are listening to the needs in this direction more than ever before. Some of these libraries are very large and very complete; especially are county high schools fortunate in this respect. The Dickinson County high-school library numbers 3000 volumes; the high-school library in Fort Scott numbers 3161 volumes; Kinsley, 1080 volumes; Montgomery County, 2000 volumes; Parsons, 1190 volumes; Reno County, 3000 volumes; Sumner County, 1085 volumes.

The laboratory equipment alone represents a large amount of money. A conservative estimate of the values may be stated in the following terms: Physical apparatus, \$56,970.25; chemistry, \$17,562.30; botany, \$20,904.50; zoölogy, \$3301. The small number of schools that offer zoölogy may be accounted for possibly from the fact that it has in the past been difficult to secure material for laboratory work. Only eighteen schools have reported classes in this subject. The University during the past year has offered to supply any high school with laboratory material in this subject at the exact cost of collecting and shipping. The department of zoölogy has established a biological station on the Pacific coast in Oregon, where each summer a large supply of laboratory material is collected and properly preserved for use in the various laboratories of the accredited high schools. It is hoped that with this opportunity of securing the needed material, classes in this subject will increase very rapidly for the next few years.

The subject of physiology does not receive the attention it deserves. Two reasons for this may be pointed out here: In the first place, elementary lessons in hygiene form a part of the supplementary work in the already overcrowded curriculum of the grades, and although the content is much diluted to suit the capacity of the pupils in this department, school men have generally considered it unnecessary to give this subject scientific treatment in the high school. All other forms of biology have a well-established place in the curriculum of the secondary schools. Is it not worth while to consider whether we are consistent in urging the claims for botany, zoölogy, chemistry, or, in fact, many of the vocational subjects, for scientific treatment in our secondary schools before we provide for careful instruction in the science of human anatomy and the functions of the various organs of the human body? Much

is being spoken and written at the present time upon the causes of many diseases which prey upon the human system, and if we are to believe statistics and give credit to all that is being said by our best physicians and authorities along these lines, it is true that the general public, including graduates of high schools and colleges as well, is woefully ignorant upon the most elementary laws of health preservation.

Which is the more important to the average student who wishes to live a useful life; to know the physiology and histology of the plant, or to be thoroughly conversant with the human anatomy and the functions and care of all of its organs? It might be worth while to consider whether it would not be more economical and more practical to teach all of these subjects relating to public health and morals in the high school rather than through the various organizations whose purpose it is to reach the adult population of the state. A second reason why this subject has not received much attention in the high school may be ascribed to the fact that few teachers may be found who are capable of giving scientific instruction in the subject of human physiology. It is possible that the colleges may be held responsible for this. If the higher institutions of learning of the state should give this subject the prominence it deserves it would probably result in a very large number of high schools giving it a place alongside of other biological sciences.

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## Barnes Law High Schools.

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The status of the Barnes law high school has not materially changed. A brief history of this act and the legal entanglements of the counties seeking to avail themselves of its benefits may be summed up as follows: In the fall of 1905, forty-three counties by popular vote carried this law by what was supposed at the time to be legal majorities. A year later it was decided by the district courts of Osage and Anderson counties that since this law had been carried only by a majority of those voting on the proposition, schools could not be legally organized. In the spring of 1908 the state superintendent of public instruction issued a statement to all counties where the law had not passed with the requisite majority, requesting that the proposition be brought before the voters of the county for their decision in the November election. Of the counties which voted a second time upon this law, only six passed with the requisite majority. In all of the other counties, twenty-three in all, schools were continued under the provisions of the act, notwithstanding the decision of the court. During the session of the legislature of 1909, by a concerted action upon the part of school boards of all Barnes law schools, a measure was brought before the legislature and passed legalizing all Barnes law high schools in counties where the schools had been maintained for one or more years, and further providing that such schools should be maintained without resubmitting the question again to the people.

It would seem that this act would clear the way for all schools

organized under its provisions which had been running for more than a year, and the matter has only been contested thus far in two or three counties of the state. There is a question at the present time before the supreme court of the state, which, when passed upon, will decide the status of this class of high schools. The question involves the power of the legislature to act under such conditions.

At the present time thirty-five counties of the state may be designated as Barnes law counties. In at least two of these, Marshall and Saline, the county treasurers refuse to turn over to the school boards the funds set aside under the provisions of this law, pending the decision of the supreme court.

The following table will give some idea as to the number of counties maintaining these schools, the number of schools in each county, the number of teachers, and the total amount paid for salaries in each county:

BARNES LAW HIGH SCHOOLS.

COUNTIES.	Number of schools.....	Number of teachers.....	Number of seniors.....	Total enrollment..	Total expendi- ture for salaries.
Allen.....	7	29	66	592	\$20,829 50
Barton.....	2	10	22	210	6,640 00
Barber.....	2	8	23	150	5,942 50
Butler.....	5	20	42	350	14,656 00
Coffey.....	4	13	25	263	8,737 25
Comanche.....	1	3	2	47	1,890 00
Cowley.....	3	19	57	507	14,048 00
Doniphan.....	4	12	30	161	8,335 13
Edwards.....	3	8	17	130	5,411 82
Finney.....	1	5	11	120	3,825 00
Ford.....	2	7	16	150	5,189 91
Gray.....	1	2	4	36	1,675 00
Hamilton.....	2	5	5	41	2,055 00
Harvey.....	4	18	59	382	13,596 00
Jefferson.....	7	20	34	351	12,040 94
Kingman.....	2	10	31	265	6,889 00
Leavenworth.....	5	15	28	263	9,135 00
Lincoln.....	3	8	18	119	5,722 50
Logan.....	1	3	10	67	2,475 00
Lyon.....	3	18	39	450	13,649 00
Marshall.....	9	26	92	567	19,577 00
Ness.....	1	3	5	68	2,305 00
Osborne.....	5	14	36	252	10,450 00
Pratt.....	1	7	23	167	6,083 00
Rice.....	4	18	69	357	11,244 97
Russell.....	3	7	18	137	1,440 00
Saline.....	3	15	42	359	14,105 00
Sedgwick.....	6	14	26	240	11,194 25
Seward.....	1	3	3	53	2,125 00
Stafford.....	2	12	36	257	9,270 00
Wabaunsee.....	5	16	20	195	11,420 00
Wallace.....	1	3	2	17	2,025 00
Wichita.....	1	3	1	23	2,250 00
Wilson.....	3	11	27	189	7,704 00
Wyandotte.....	5	22	57	432	17,056 26

The above table shows that Barnes law schools are maintained now in thirty-five counties. These counties maintain from one to nine high schools, or a total of 112. There are 407 teachers employed, and there is this year a total enrollment of 7967 pupils. Of the total number of seniors who graduate in June, 1910, 996, or 12.5 per cent of the total enrollment, will graduate from these schools.

It is also interesting to note that the total amount of salaries paid teachers in these schools is \$290,992.03, which is an average of \$71.49 per month. This average is a little more than \$6 above the total average of all the high schools in the state. The average cost per pupil in these schools, based on salaries alone, is \$4.05 per month. When compared with the general average for the state or for the cities of the first and second class, this average is large; it must be remembered, however, that the enrollment in many of these high schools is yet very small, and although it is a large increase over last year, when the opportunities offered are properly understood by the people in the rural districts, the attendance will increase by a very large per cent.

Comparative statistics with one or two counties for the last two years will give some idea of the rapidity with which these schools are growing. The enrollment in Marshall county last year was 440 students, distributed among seven high schools; for this year there are 567 students enrolled in nine high schools. In Jefferson county last year seven high schools enrolled 276 pupils; this year the same number of high schools enrolls 357 pupils. Only one county in the state has a smaller enrollment this year than in the previous year. The largest number of high schools in any one county is nine, namely, Marshall county. Allen and Jefferson each have seven; Wyandotte, Wabaunsee, Osborne, Leavenworth and Butler each have five, while Sedgwick has six. The number of seniors being only 12.5 per cent of the total enrollment is not a fair showing for these schools. Many of them have been organized two years or less, hence we would naturally expect the senior class to be comparatively small, and yet this is only 1 per cent below the general average for the state, which is 13.5 per cent; the average for the county high schools being 14.5 per cent.

I believe that this method of supporting high schools will become very popular as the real spirit of the law penetrates further into the life of the rural community. It is rather strange that the people for whom these schools are especially intended should be the most persistent in opposing them. The past year has done much to popularize this law, and it is a safe prediction that when all classes become acquainted with its real significance and true worth to the community it will be supported generously and opposition will cease.

The idea that its purpose is to compel the farming community to support high schools for the cities and towns has no foundation in fact. Its purpose is, in both theory and practice, to secure better and more advanced educational facilities for the *county, and all the people in the county*. The urban and rural communities should stand together on the great question of education, and should support their schools with one accord, on the broad principle of equal opportunities for all.

## County High Schools.

The county high school has been true to the purpose for which it was organized, namely, to prepare teachers for the district schools and to provide educational facilities for students of rural communities who desire to avail themselves of educational advantages beyond those offered in the rural school district.

### COUNTY HIGH SCHOOLS.

NAME OF SCHOOL.	How established.	Date.....	Graduates of normal course..	Graduates of business course..	Graduates of college course ..	Number entering college.....
Atchison County.....	Popular vote.....	1890	201	31	68	58
Chase County.....	Special enactment.....	1903	45	3	28	25
Cherokee County.....	Popular vote.....	1900	132	45	92	38
Cheyenne County.....	Special act.....	1903	①			
Clay County.....	Popular vote.....	1900	144	14	73	50
Crawford County.....	Popular vote.....	1903	60	24	20	16
Decatur County.....	Special enactment.....	1906	19	22	43	25
Dickinson County.....	Popular vote.....	1889	222	26	90	98
Gove County.....	Special act.....	1903	②			
Gray County.....	Special enactment.....	1907	③			
Greeley County.....	Popular vote.....	1908	④			
Kiowa County.....	Popular vote.....	1906	0	0	6	2
Labette County.....	Special enactment.....	1893	317	48	54	48
Lane County.....	Popular vote.....	1902	⑤			
Montgomery County.....	Special enactment.....	1899	54	39	76	73
Norton County.....	Special enactment.....	1899	75	34	64	51
Rawlins County.....	Special enactment.....	1905	9	0	9	4
Reno County.....	Special act.....	1899	104	150	16	40
Scott County.....	Petition of voters.....	1901	0	5	18	7
Sheridan County.....	Special enactment.....	1903	11	0	28	0
Sherman County.....	Special enactment.....	1903	9	0	17	7
Sumner County.....	Special enactment.....	1897	99	2	137	85
Thomas County.....	Special enactment.....	1898	65	50	43	25
Trego County.....	Popular vote.....	1905	0	0	32	15

1. No data received.

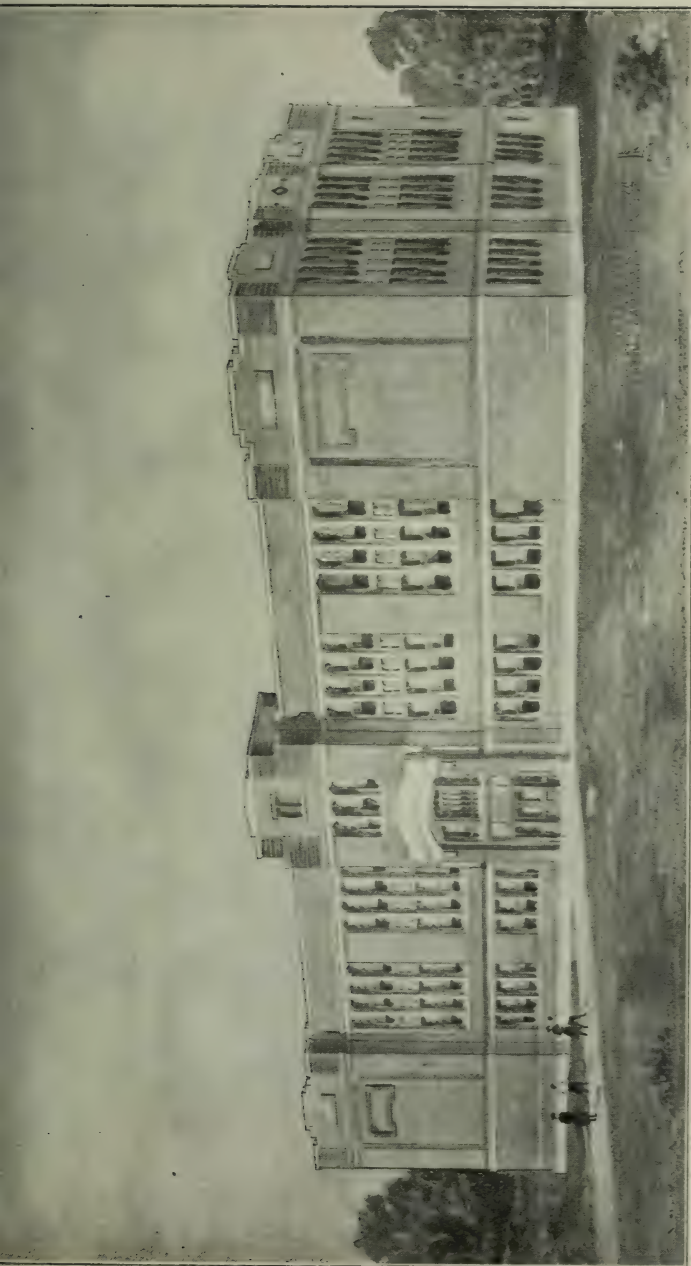
2. Discontinued June, 1909.

3. No graduates until 1910.

4. No graduates until 1911.

5. No data at hand.

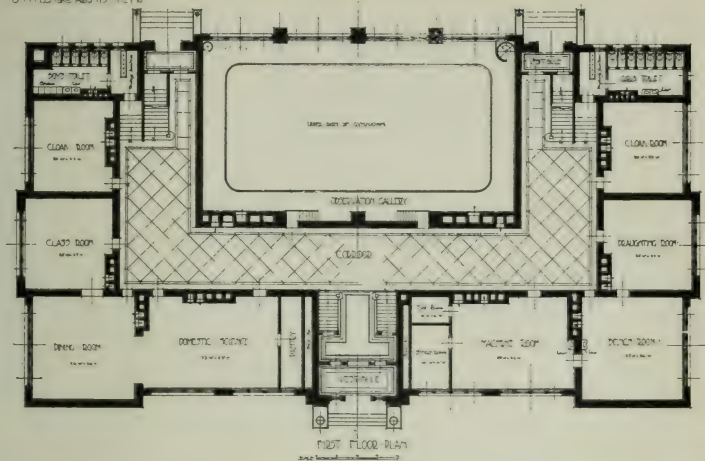
The table shown above illustrates the manner and date of establishment and number and distribution of graduates in these schools during the whole period of their existence. The law requires each school to offer three courses of study, but, as the demand for vocational subjects has increased, courses have been added including business subjects, manual training, agriculture, and other branches of kindred nature. At the present time almost every department of secondary grade is found in the curriculum of the fully organized county high school. The table referred to



HUTCHINSON HIGH SCHOOL. (Cost about \$120,000.)



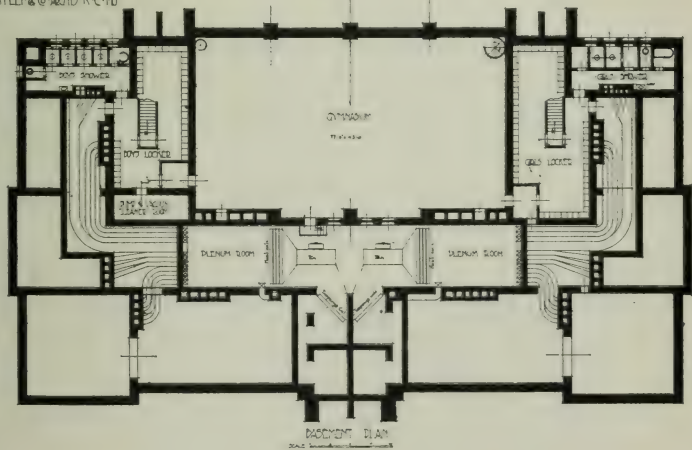
HIGH SCHOOL  
MUTCHWOOD - MANDALAY  
J. H. KELLY & CO. ARCHT. - K. C. MO.



FIRST-FLOOR PLAN.

Hutchinson.

HIGH SCHOOL  
MUTCHWOOD - MANDALAY  
J. H. KELLY & CO. ARCHT. - K. C. MO.

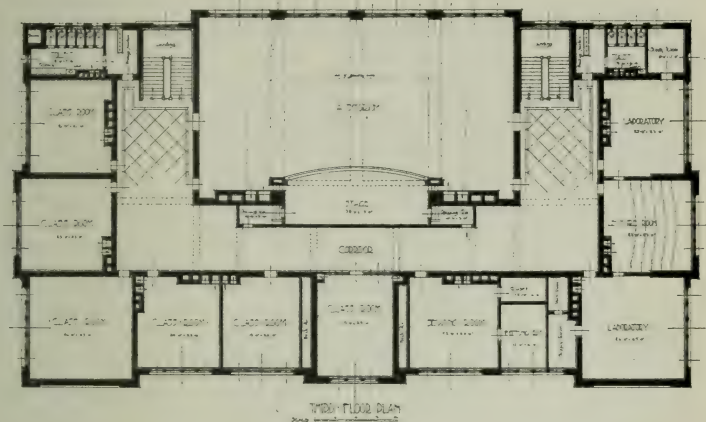


BASEMENT PLAN.

Hutchinson.



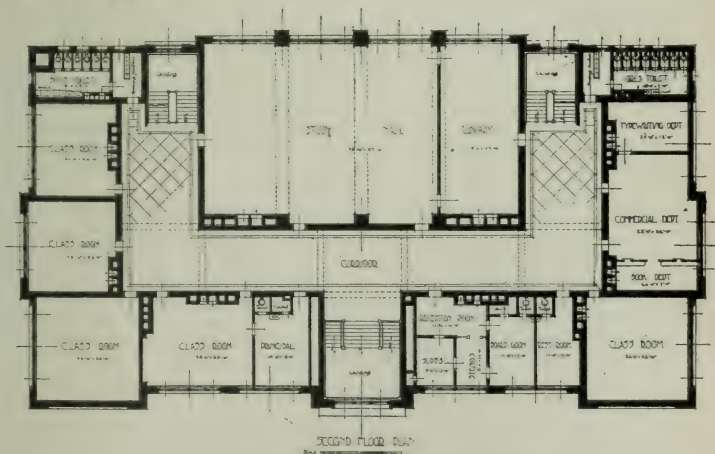
HIGH SCHOOL  
HUTCHINSON - KANSAS  
J. H. FULTON & CO. ARCHT. & ENGRS.



THIRD-FLOOR PLAN.

*Hutchinson.*

HIGH SCHOOL  
HUTCHINSON - KANSAS  
J. H. FULTON & CO. ARCHT. & ENGRS.



SECOND-FLOOR PLAN.

*Hutchinson.*



gives the number graduating from the normal, collegiate and commercial or business courses.

This table shows that 1566 students have graduated from the normal-training course and have received certificates to teach in the common schools of the state. These schools have to their credit 914 graduates of a collegiate course and 493 who have completed a course in business or commercial work. According to the figures received the total number of graduates equal 2973, 52 per cent of which number have elected normal-school work and have received teachers' certificates; 32 per cent have taken the collegiate course. The table also shows that 667 graduates of the county high schools have entered college; this would represent about 23 per cent of the total number of graduates, or a little lower per cent than the number entering college from the total number of graduates for the year 1909, which was a little over 26 per cent.

In many respects this is a remarkable showing. The average length of time in which these schools have been in operation is about eight years. With a total of 1556 normal graduates it is readily seen that each year an average of 200 students are certificated to teach in the common schools. While we have no figures to show the exact number who actually teach, yet assurances come from all that a very large per cent engage in teaching and many pursue their studies further in the various branches of the State Normal School. In this respect the county high schools have been supplying a real need—that of furnishing trained teachers for the rural schools. They have been no less efficient in the number of students which they have prepared for higher educational pursuits in other institutions.

The fact that the county high school has back of it the entire resources of the county to a certain extent removes the uncertainty of financial support which obtains in many of the city schools. The levy for maintenance ranges between one and three mills on the dollar, which, being the levy on the entire property of the county, will produce sufficient means and ample provisions for the successful management of these schools without imposing a burden upon the individual taxpayer. Hence, in most of these schools we find well-equipped laboratories, well-filled libraries, and buildings modern and sufficiently large for the accommodation of the school.

The following table illustrates the progress made in these schools during the last five years, ending June, 1909. The total enrollment in all of these schools has increased 58 per cent; the number of teachers employed, including principals, has increased from 76 to 140, a gain of 84 per cent on all, or a gain of 60 per cent on the schools founded prior to 1904. The total number of volumes in the libraries has increased from 10,278 to more than twice that number, or 22,652. During this period also the valuation of laboratory apparatus has increased from \$1650 to over \$12,000. While these figures are not absolutely correct, owing to the lack of data for the year 1904, nevertheless they approximate the rapid growth which the county high schools have shown for a period of five years.

The annual salary roll, including the amount paid to principals and teachers, reaches the sum of \$116,508.08 for the year 1909-'10. The total enrollment at the present time is 3171, the total number of teachers 138, and the members of the senior class number 462.

## GROWTH OF COUNTY HIGH SCHOOLS.

NAME OF SCHOOL.	Enrollment.		Number of teachers.		Volumes in library.		Value of apparatus.	
	1904.	1909.	1904.	1909.	1904.	1909.	1904.	1909.
Atchison County.....	183	88	7	8	2,000	2,950	\$150	\$550
Chase County.....	108	123	5	6	0	718	.....	475
Cherokee County.....	.....	353	.....	13	.....	1,040	.....	1,300
Cheyenne County.....	.....	.....	.....	.....	.....	.....	.....	.....
Clay County.....	260	317	8	11	800	967	100	700
Crawford County.....	100	146	5	7	300	400	.....	550
Decatur County.....	108	142	4	6	100	516	50	285
Dickinson County.....	141	200	7	9	2,700	3,500	150	450
Gove County.....	18	①	3	.....	600	.....	50	.....
Gray County.....	.....	36	.....	2	.....	202	.....	175
Greeley County.....	.....	19	.....	1	.....	0	.....	.....
Kiowa County.....	.....	54	.....	3	.....	90	.....	80
Labette County.....	139	178	6	8	700	1,050	150	350
Lane County.....	.....	38	.....	2	.....	0	.....	.....
Montgomery County.....	200	320	7	10	1,500	2,000	600	2,000
Norton County.....	136	189	5	8	.....	1,200	300	680
Rawlins County.....	.....	70	.....	4	.....	259	.....	207
Reno County.....	.....	206	.....	9	.....	3,750	.....	1,750
Scott County.....	16	48	2	2	78	350	.....	225
Sheridan County.....	34	55	2	3	0	600	.....	325
Sherman County.....	.....	61	.....	4	.....	300	.....	150
Sumner County.....	382	300	11	15	1,000	1,500	50	1,350
Thomas County.....	145	81	4	5	500	660	50	800
Trego County.....	.....	100	.....	4	.....	600	.....	450

1. Discontinued, 1909.

The average monthly salary paid to teachers, exclusive of principals, is \$84.55, which is \$12.06 above the average amount paid to teachers in the Barnes law high schools, and \$19.40 per month more than the average for high school assistants in the affiliated schools of the state. The number of seniors for this year represents 14.5 per cent of the total enrollment, which is 1 per cent higher than that represented in the Barnes law high schools, and 2 per cent higher than the general average for the state. The average number of pupils for each teacher is twenty-three, and the cost per month for each pupil enrolled is \$4.08, or, for one year of nine months, \$36.72.

Comparing the expenditures for salaries of high-school principals and assistants in cities of the first class with those of the county high schools gives the advantage slightly in favor of the former. Average salary paid high-school principals in cities of the first class is \$1572.50; average monthly salary of assistants, \$85.61, while the salaries of corresponding officials in the county high schools are \$1283.41 and \$84.55.

In the majority of counties the boards of trustees have exercised good judgment in the care with which they have constructed and equipped their school buildings. These school buildings are usually erected in the center of a large and beautiful lawn located in the suburbs of the town or city. As a rule they are ideal places for a school, having ample space for all forms of school athletics in the immediate vicinity of the buildings. These lawns are beautifully decorated with trees and flowers and all kinds of shrubbery.

The buildings, especially the newer ones, are among the best in the state. They are constructed on a large plan, affording an abundance of room for a large auditorium, library, laboratories, business and manual-training departments, in addition to a sufficient number of recitation rooms. In only a few cases have the school authorities made the mistake of erecting cheap buildings, and these cases are usually found in the counties where the law requires the district in which the school is located to furnish and equip the buildings. Some of these structures are not only poor in quality but are inadequate to supply the needs of a school.

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## High-School Architecture.

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The economy of modern education considers the environment of the child as important as the positive instruction of the drill master. Educators have always known how easily the child absorbs knowledge and forms his ideals from his surroundings, but the educator has not been able, until recent years, to act upon this, nor, indeed, is he or the public fully awakened to the importance of the question. The attempts to decorate the interior of the schoolrooms by pictures, in recent years, is an evidence of the recognition of the value of art in the moral and intellectual training of the child.

Only quite recently has there been a movement toward improving the architecture of schoolhouses. The common method has been to choose some piece of waste land which was undesirable for other purposes and use it for the school grounds. This yard is usually too small for its purpose. Sometimes attempts are made to beautify it by planting trees, but in most instances the summer weeds are not cut until school opens in the autumn. The schoolhouse is built without regard to exterior looks or interior advantages, and with the least possible cost.

All of this neglect is not only a waste of money expended because it does not facilitate the work of instruction, but it has a bad effect also on the moral and esthetic nature of the child. Just as the influence of beauty on child life develops a normal, moral being, so the influence of ugliness has the opposite effect, giving distorted views of life and low ideals. In other words, beauty is elevating; ugliness is degrading.

Now how shall these defects be remedied? In the first place a large school yard of several acres should be chosen in a dry, healthful and beautiful situation. Flowers, trees and shrubs should ornament the immediate surroundings of the building. Adjacent to this should be the playgrounds, part of which should be set to trees for shade and other parts left open for the baseball, football and other sports.

The building itself should be constructed on lines of architectural beauty. It will cost but little more to have an architect who can prepare plans that can give the house an exterior expression of beauty. In planning the interior, care should be taken to concentrate the light as much as possible either at one side or at the

back of the recitation room, so that a multitude of cross lights will not injure the eyes of the children. Ventilation should also be given careful attention. If the schoolroom is heated by a furnace, then it will be easy to draw the impure air out of the schoolroom. If not, then there should be ventilating shafts which will allow the air to pass out at the top and bottom of the room without opening a window in such place as to throw a draft upon the children.

The decoration of walls should be chosen with an artistic sense. The teacher should not put upon the walls every variety and conceivable kind of pictures. He should choose the pictures that are harmonious with each other and harmonious with the surroundings. Every picture put upon the walls should be a work of art in itself.

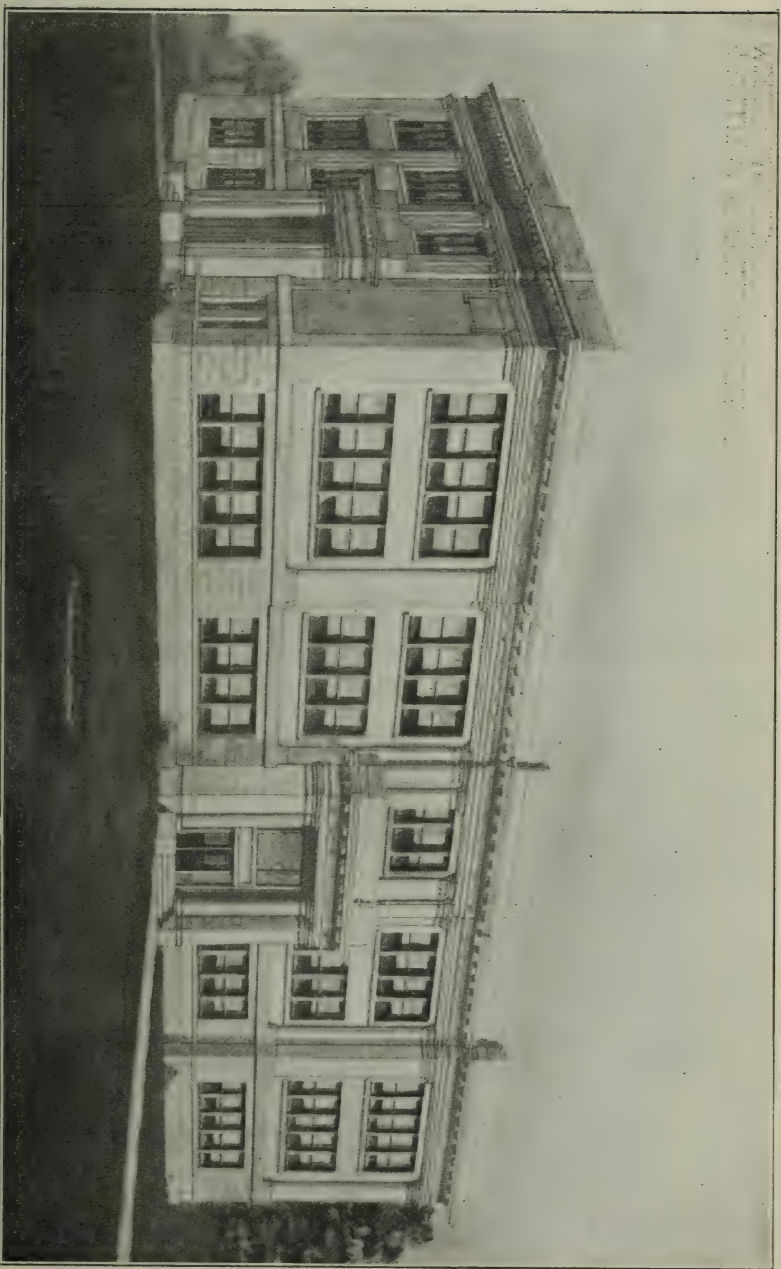
It costs a little more, it is true, but a substantial school building with ample grounds, constructed with a view of architectural beauty and interior arrangement and decoration, is the best economy a school district can exercise. It is a picture "that hangs forever on memory's wall," and is a masterful influence on the child's moral, mental and physical nature. It costs but little more to have things done right than it does to have them done wrong, and the difference between right and wrong is the difference between daylight and darkness. Put a great deal of thought and a little more money together and you will get greatly increased results from your educational effort.

In view of the above statements it might not be out of place to call attention to certain improvements made in high-school architecture during the past two or three years.

The last two years will long be remembered in the educational history of this state as a period of great improvement in school architecture. The old, poorly heated, poorly ventilated structures have been discarded and new modern buildings have been erected in their place. The number of new school buildings to be used for general educational purposes will probably reach 100; 35 of these have been constructed for high-school purposes alone, at a total cost of hundreds of thousands of dollars. Among the larger and more expensive improvements may be mentioned the Clay County high school at Clay Center, the city high schools at Atchison, Salina, Kansas City, Hutchinson, Mankato, Great Bend and Abilene.

These buildings have been constructed on the principle that the best is the cheapest in the long run, regardless of original cost. The best lighting, heating and ventilating systems that modern skill can produce have been installed, and the floor space, including the basements, has been so arranged as to provide for every department of high-school work. The exteriors show good proportions and are finished with a view to symmetry and beauty which will make them a credit to the civic pride of the community.

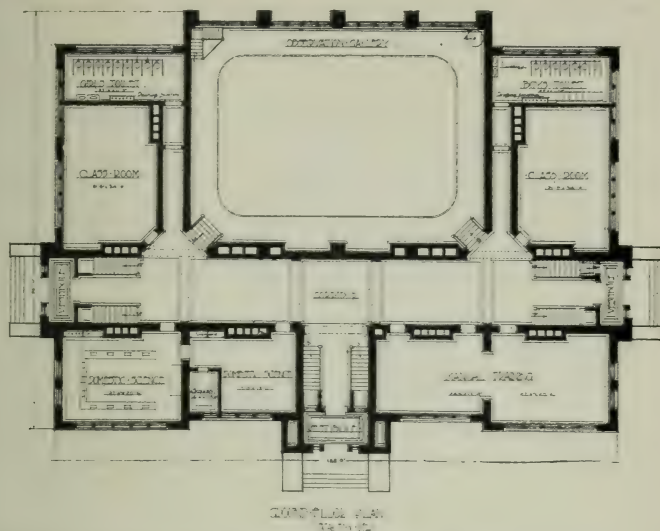
The end of this period of improvement in school architecture has not yet come. Boards of education are making thorough study of school problems and school hygiene in so far as they may be improved through the means of better buildings, better furniture and better equipment; and where the resources of the district will permit, the most modern appliances are installed without regard to the cost. There are a number of high-school buildings in the state at the present time, either completed or in process of construction,



WINFIELD HIGH SCHOOL. (Cost about \$76,000.)



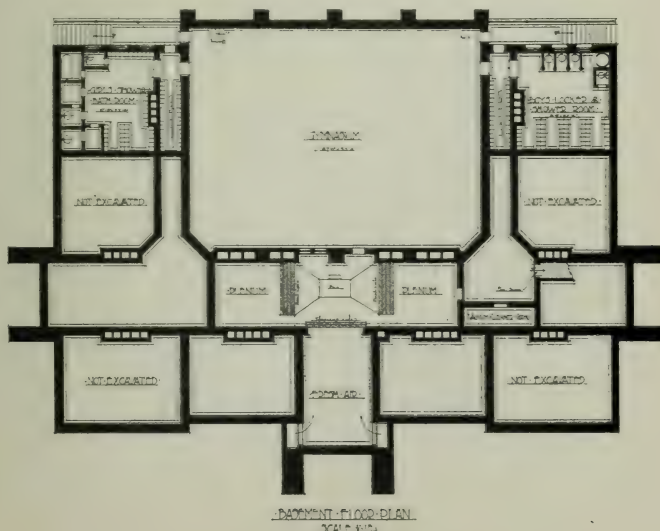
PLANS FOR WINFIELD HIGH SCHOOL  
 WINFIELD - KANSAS  
 J. M. FELT & C. ARCHTS. N. C. MO.



GROUND-FLOOR PLAN.

*Winfield.*

PLANS FOR WINFIELD HIGH SCHOOL  
 WINFIELD - KANSAS  
 J. M. FELT & C. ARCHTS. N. C. MO.

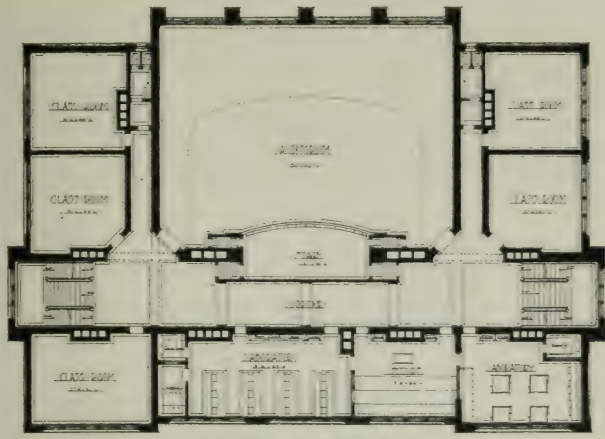


BASEMENT PLAN.

*Winfield.*



PLAN - C. WINFIELD HIGH SCHOOL  
 WINFIELD, KANSAS  
 J. M. FELT & CO. ARCHTS. - K. C. MO.

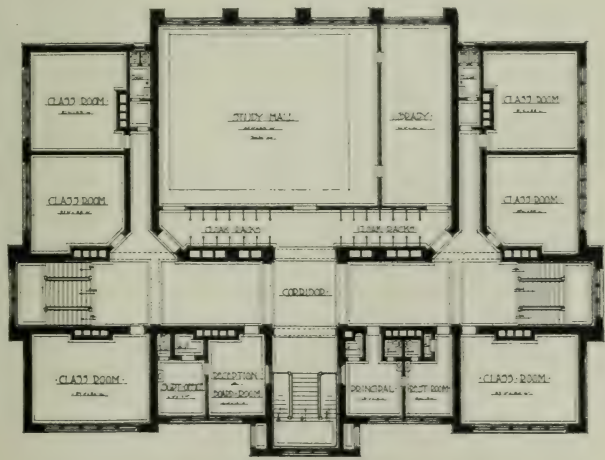


SECOND FLOOR PLAN - C.

SECOND-FLOOR PLAN.

*Winfield.*

PLAN - B. WINFIELD HIGH SCHOOL  
 WINFIELD, KANSAS  
 J. M. FELT & CO. ARCHTS. - K. C. MO.



FIRST FLOOR PLAN - B.



which represent a cost of more than \$100,000 each, and the policy in the smaller towns, where smaller buildings are sufficient to accommodate the school, is to make them as complete as possible in every department and to provide for the best instruction possible in all phases of high-school work. If the present ideals on this subject continue to improve and find expression in beautiful, commodious high-school structures, in a few years more Kansas will not be behind other states in the matter of housing her school children.

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## Some Conditions which Interfere with Consistent School Work.

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The most successful schools of our country are those which have been conducted under a well-established policy for a long period of years. No school can become great, either in technical resources or in breadth of influence, which every few years is subjected to a change of management or general policy of organization. The high schools of Kansas have not yet grown into that period of long tenure for teachers and fixed general policy with reference to the scope and character of work. Undoubtedly the last few years have shown improvements in this direction, but a careful investigation shows that 53 per cent of the principals and superintendents are occupying their present positions this year for the first time. This condition signifies a certain change in policy, arrangement of courses, ideals in government and standards of efficiency. It will require at least one-half of the year for the pupils to become adjusted to the new *régime*, and then in all probability at the beginning of school in September, 1910, they will be called upon to undergo again this annual readjustment.

This condition, which so interferes with a high standard of work, could be improved very much if school boards would be more careful in the selection of their principals and instructors, and when once right persons have been employed, seek by every reasonable means to hold them for a number of years. Boards of education are willing to permit teachers to leave their employ for very slight causes. A few dollars per month increase in the salary of the teacher is of small consequence to the district compared with the waste incident to changes in reorganization of classes and courses of study. Again, it often happens that teachers are dropped from their positions without the assignment of any real cause other than some slight personal grievance. By a little effort all such difficulties could be adjusted.

Another cause of this continual change in the management of schools may be attributed to the instructors themselves. As a rule, teachers, in common with all professional people, are anxious to advance as rapidly as possible. The specialist desires to secure a position where he can follow the subject of his choice and for which he is especially trained. The teacher who, on account of lack of experience, must take a position in a small high school, is anxious to advance to the larger school where there is greater va-

riety of work and interests in school and advantages of a social nature out of school; and then the salary question must receive due consideration by all. These, with other causes, make it almost impossible for a school to be operated for a period of two years in succession without change in its management or teaching force. Of course it will take time to change all of these things.

Two points, however, might be mentioned which would help matters very much. In the first place, the conditions in a school located in the medium-size or small towns should be made just as attractive as they are in the larger schools. This means good buildings, ample equipment, wholesome school spirit and a public sentiment in sympathy with the school and the daily work of the teacher. Such conditions will make almost any school a homelike place for the earnest teacher, and a place in which she can use her strength and ability in teaching, and not be compelled to waste her energies in attempting to overcome difficulties in her work which would not exist if the patrons of the school were doing their duty.

In the second place, a teacher often makes a mistake by leaving a position too soon. The first year for the inexperienced teacher is trying in many ways; she does not have the opportunity to really form for herself any basis for work. The whole year is occupied in learning again the subjects which she must teach, and in experimenting some, often to the disadvantage of the pupils, as to methods of presentation. All of this must be done under the stress of the ever-present problem of discipline; hence, at the close of the first year the careful teacher is just ready to organize her subject matter, choose the best way of presenting it to the pupils, and do all without the fear of an uprising at any moment by the members of the class. The second year's work will clear up many difficulties which seemed insurmountable at the beginning; it will add confidence and strength to teaching ability, and service in the schoolroom will become a real pleasure. If a teacher changes at the end of the first year it will be very much like beginning over again. Conditions will be new, pupils strange, and much time will be needed to become acquainted with all these changes. For the good of the school, as well as for the best interests of the teacher, she should remain not less than two years in one position, and often three or four years would be profitably spent in the same place even at a few dollars less salary per year.

Another factor which enters into this problem of school solidarity is the scarcity of high-school teachers who are sufficiently trained to give the kind of service demanded by superintendents and school boards. The time was when school authorities boasted that the supply of teachers was unlimited and that they could secure teachers and fill their positions at any time for their own price. This is no longer true. The standard of scholarship for high-school instruction has advanced, ideals of discipline have improved, personal character and personal influence count for more. These qualities are not cheap; teachers possessing them cannot be secured at all times. During the year ending January 1, 1909, 350 requests for high-school teachers came to the committee on appointments at the University. The list of available teachers registered with that committee, who were qualified and indorsed for

teaching positions, only exceeded 200 by a very few. There was a demand upon the University alone for over 50 men for executive and teaching positions in the high schools, service to begin September 1, 1909, and for the most part these requests came from schools that were able and willing to pay good salaries, but the men were not to be had. More teachers were imported from institutions outside of Kansas last year than for any previous year since 1903. This is a condition which the educational institutions of the state have undertaken to improve, and doubtless some results may be expected in the near future.

Salaries have increased very materially for positions requiring executive ability; even the average monthly salary of the high-school instructor is one dollar more this year than the year before. This is not a large increase, but it shows the tendency, and the constant demand for better teachers will eventually bring more and better material into the field.

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## Mechanic and Household Arts.

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The subject which has been prominent in educational discussions for the past four or five years is that of industrial and commercial branches in the high school. At the outset educators were not altogether agreed as to the real merit of these branches as positive forces in education. By some they were advocated because of the assumption that the interest in *doing something* rather than *thinking about something* would appeal to a larger number of pupils, especially the boys, and have a tendency to hold them in school. Others favored them upon the grounds of real educational value, that there was a moral and mental discipline in the study of these subjects and that no educational platform would be complete and well rounded out without a limited amount of hand training. For both classes of advocates of these subjects in the high schools the question resolved itself finally into a matter of ways and means. It was discovered that these were expensive courses; to fit up a laboratory for domestic science or art and for manual training, even in an elementary way, taxed the resources of even the best schools to the limit.

Five years of experience has been of much value to superintendents and school managements upon this subject of industrial education and the result has been that all have come to realize that this line of work is of truly educational value and that no school curriculum is complete without a certain amount of manual work. This experience is also very convincing evidence that the introduction of these subjects alone is not a sure means of holding the boys in school; and further, and what is more important, that it in no wise takes the place of that training and culture which can only come from humanistic studies.

At the beginning, industrial subjects were attractive; they called for new methods, a distinct change in the form of recitation and daily routine, which change was interesting, but which became

dissipating in so far as other subjects were concerned. The natural attractions of the subjects were so emphasized by the teachers, as well as parents, that close application and study in other well-established lines of high-school work was almost impossible. School districts of limited means were induced to add certain phases of this work to their daily programs without giving due consideration to the cost of maintenance and the salary for special teacher, with the result that after two or three years of failure the subject was entirely abandoned. These are only incidents in the experience of a number of schools where the subject was not given careful thought and where conditions were in no wise ready for the addition of this phase of educational work.

The development of these subjects in our high schools during the past two years has been conservative and along right lines. They are being introduced in schools where the districts can afford the extra expense and where the necessary equipment and specially prepared teachers will not be a burden on those who support the schools. Manual training is also taking its proper place in its relation to other departments in the high school. There is no longer a disposition to make a technical school of the high school, but a proper amount of this work is offered for its strictly educational value. It has ceased to be a means of entertainment or an attraction to increase the school enrollment, and is placed upon the same basis as other subjects in that it demands exact, serious effort in working out a definite project. In this regard it has strengthened the general high-school course of study. Its demands upon the pupil are definite. At one and the same time it holds the attention of the pupil in the accomplishment of a certain purpose and serves as a recreation from other school duties. Manual training also affords an easy solution of the problem of art teaching in the high school. These two departments are closely related and neither can be developed to any great extent without the other.

The best high schools of the state have well-appointed departments for manual training and domestic art and science, and in all of the modern school buildings ample provision has been made for these subjects in the form of well-lighted rooms, complete equipment, and almost every needed facility.

Respectfully submitted.

W. H. JOHNSON, *High-school Visitor.*

UNIVERSITY OF ILLINOIS

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PRESIDENT'S OFFICE



Vol. 12  
p. 2

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Vol. XII. DECEMBER, 1910. No. 3

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**High School Manual No. 9.**

*Department of School Visitation*  
OF THE  
**UNIVERSITY OF KANSAS.**

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**A High School Bulletin in English  
and Mathematics.**

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# Course in English for High Schools.

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## THREE-YEAR COURSE.

The three required units in English are those recommended by the National Conference on Uniform Entrance Requirements in English, to which has recently been delegated by the North Central Association of Colleges and Secondary Schools, that supervision of college entrance requirements in English formerly exercised by the Association itself, acting with others. That Conference will meet at least once in three years, and its recommendations will be accepted by practically all leading colleges in the United States. The following includes the general statement and explanation formulated by the Conference in what may be regarded as its first report.

Preparation in English has two main objects: (1) Command of correct and clear English, spoken and written; (2) ability to read with accuracy, intelligence, and appreciation.

### ENGLISH GRAMMAR AND COMPOSITION.

I. The first object requires instruction in grammar and composition. English grammar should ordinarily be reviewed in the secondary school; and correct spelling and grammatical accuracy should be rigorously exacted in connection with all written work during the four years. The principles of English composition governing punctuation, the use of words, paragraphs, and the different kinds of whole composition, including letter writing, should be thoroughly mastered; and practice in composition, oral as well as written, should extend throughout the secondary-school period. Written exercises may well comprise narration, description, and easy exposition and argument based upon simple outlines. It is advisable that subjects for this work be taken from the student's personal experience, general knowledge, and studies other than English, as well as from his reading in literature. Finally, special instruction in language and composition should be accompanied by concerted effort of teachers in all branches, to cultivate in the student the habit of using good English in his recitations and various exercises, whether oral or written.

### LITERATURE.

II. The second object is sought by means of two lists of books, headed respectively *reading* and *study*, from which may be framed a progressive course in literature covering four years. In connection with both lists, the student should be trained in reading aloud and be encouraged to commit to memory some of the more notable passages both in verse and in prose. As an aid to literary appreciation, he is further advised to

acquaint himself with the most important facts in the lives of the authors whose works he reads, and with their place in literary history.

a. READING. The aim of this course is to foster in the student the habit of intelligent reading and to develop a taste for good literature, by giving him a first-hand knowledge of some of its best specimens. He should read the books carefully, but his attention should not be so fixed upon details that he fails to appreciate the main purpose and charm of what he reads.

With a view to large freedom of choice, the books provided for reading are arranged in the following groups, from which at least ten units\* are to be selected, two from each group, unless otherwise indicated:

\*Each unit is set off by semicolons.

#### FOR 1910 AND 1911:

GROUP I (two books to be selected): Shakspeare's *As You Like It*; Shakspeare's *Junius Caesar*; Shakspeare's *The Merchant of Venice*; Shakspeare's *Twelfth Night*; Shakspeare's *Henry V.*

GROUP II (one book to be selected): Bunyan's *The Pilgrim's Progress*, part I; Bacon's *Essays*; the *Sir Roger de Coverley Papers* (in the "*Spectator*"); Franklin's *Autobiography*.

GROUP III (one book to be selected): Chaucer's Prologue; selections from Spenser's *Faerie Queene*; Pope's *The Rape of the Lock*; Goldsmith's *The Deserted Village*; Palgrave's *Golden Treasury* (first series), books II and III, with especial attention to Dryden, Collins, Gray, Cowper, and Burns.

GROUP IV (two books to be selected): Hawthorne's *The House of the Seven Gables*; Thackeray's *Henry Esmond*; George Eliot's *Silas Marner*; Dickens's *A Tale of Two Cities*; Scott's *Ivanhoe*; Scott's *Quentin Durward*; Goldsmith's *The Vicar of Wakefield*; Mrs. Gaskell's *Cranford*; Blackmore's *Lorna Doone*.

GROUP V (two books to be selected): Emerson's *Essays* (selected); Ruskin's *Sesame and Lilies*; Irving's *Sketch Book*; Carlyle's *Heroes and Hero-worship*; De Quincey's *Joan of Arc* and *The English Mail Coach*; Lamb's *Essays of Elia*.

GROUP VI (two books to be selected): Palgrave's *Golden Treasury* (first series), book IV, with especial attention to Wordsworth, Keats, and Shelley; Coleridge's *The Ancient Mariner*; Lowell's *The Vision of Sir Launfal*; Scott's *The Lady of the Lake*; Poe's *Poems*; Tennyson's *Gareth and Lynette*, *Lancelot and Elaine*, and *The Passing of Arthur*; Arnold's *Sohrab and Rustum*; Byron's *Mazeppa* and *The Prisoner of Chillon*; Longfellow's *Courtship of Miles Standish*; Browning's *Cavalier Tunes*, *The Lost Leader*, *How they Brought the Good News from Ghent to Aix*, *Evelyn Hope*, *Home Thoughts from Abroad*, *Home Thoughts from the Sea*, *Incident of the French Camp*, *The Boy and the Angel*, *One Word More*, *Herve Riel*, *Pheidippides*; Macaulay's *Lays of Ancient Rome*.

#### FOR 1912:

The same as for 1910 and 1911, with the following exceptions: In group V, for Carlyle's *Heroes and Hero-Worship* substitute Carlyle's *The Hero as Poet*, *The Hero as Man of Letters*, and *the Hero as King*;

and in group VI, for Tennyson's Gareth and Lynette, etc., substitute Tennyson's Princess.

#### FOR 1913, 1914, AND 1915.

I. The Old Testament, comprising at least the chief narrative episodes in Genesis, Exodus, Joshua, Judges, Samuel, Kings, and Daniel, together with the books of Ruth and Esther; the Odyssey, with the omission, if desired, of books I, II, III, IV, V, XV, XVI, XVII; the Iliad, with the omission, if desired, of books XI, XIII, XIV, XV, XVII, XXI; Vergil's Aeneid. The Odyssey, Iliad, and Aeneid should be read in English translations of recognized literary excellence.

For any unit of this group a unit from any other group may be substituted.

II. Shakspeare's Merchant of Venice; Midsummer Night's Dream; As You Like It; Twelfth Night; Henry the Fifth; Julius Cæsar.

III. Defoe's Robinson Crusoe, Part I; Goldsmith's Vicar of Wakefield; either Scott's Ivanhoe, or Quentin Durward; Hawthorne's House of the Seven Gables; either Dickens's David Copperfield, or Tale of Two Cities; Thackeray's Henry Esmond; Mrs. Gaskell's Cranford; George Eliot's Silas Marner; Stevenson's Treasure Island.

IV. Bunyan's Pilgrim's Progress, Part I; the Sir Roger de Coverley Papers in the Spectator; Franklin's Autobiography (condensed); Irving's Sketch Book; Macaulay's Essays on Lord Clive and Warren Hastings; Thackeray's English Humorists; Selections from Lincoln, including at least the two Inaugurals, the Speeches in Independence Hall and at Gettysburg, the Last Public Address, and Letter to Horace Greeley, along with a brief memoir or estimate; Parkman's Oregon Trail; either Thoreau's Walden, or Huxley's Autobiography and selections from Lay Sermons, including the addresses on Improving Natural Knowledge, A Liberal Education, and A Piece of Chalk; Stevenson's Inland Voyage and Travels with a Donkey.

V. Palgrave's Golden Treasury (first series), books II and III, with especial attention to Dryden, Collins, Gray, Cowper, and Burns; Gray's Elegy in a Country Churchyard and Goldsmith's Deserted Village; Coleridge's Ancient Mariner and Lowell's Vision of Sir Launfal; Scott's Lady of the Lake; Byron's Childe Harold, Canto IV, and The Prisoner of Chillon; Palgrave's Golden Treasury (first series), book IV, with especial attention to Wordsworth, Keats, and Shelley; Poe's Raven, Longfellow's Courtship of Miles Standish, and Whittier's Snow-Bound; Macaulay's Lays of Ancient Rome and Arnold's Sohrab and Rustum; Tennyson's Gareth and Lynette, Lancelot and Elaine, and The Passing of Arthur; Browning's Cavalier Tunes, The Lost Leader, How they brought the Good News from Ghent to Aix, Home Thoughts from Abroad, Home Thoughts from the Sea, Incident of the French Camp, Herve Riel, Pheidippides, My Last Duchess, Up at a Villa—Down in the City.

b. STUDY. This part of the requirements is intended as a natural and logical continuation of the student's earlier reading, with greater stress laid upon form and style, the exact meaning of words and phrases, and the understanding of allusions. For this close reading are provided a play, a group of poems, an oration, and an essay, as follows:

## FOR 1910 AND 1911.

Shakspeare's *Macbeth*, Milton *Lycidas*, *Comus*, *L'Allegro*, and *II Penseroso*; either *Burke's Speech on Conciliation with America*, or both *Washington's Farewell Address* and *Webster's First Bunker Hill Oration*; either *Macaulay's Life of Johnson* or *Carlyle's Essay on Burns*.

## FOR 1912.

The same as for 1910 and 1911, except that *Tennyson's Gareth and Lynette*, *Lancelot and Elaine*, and *The Passing of Arthur* may be substituted for *Milton's Minor Poems*.

## FOR 1913, 1914, AND 1915.

The same as for 1910 and 1911, except that *Milton's Lycidas* may be omitted.

## EXAMINATION.

However accurate in subject matter, no paper will be considered satisfactory if seriously defective in punctuation, spelling, or other essentials of good usage.

The examination will be divided into two parts, one of which may be taken as a preliminary and the other as a final.

The first part of the examination will be upon ten units chosen, in accordance with the plan described earlier, from the lists headed *reading*; and it may include also questions upon grammar and the simpler principles of rhetoric, and a short composition upon some topic drawn from the student's general knowledge or experience. On the books prescribed for reading, the form of the examination will usually be the writing of short paragraphs on several topics which the candidate may choose out of a considerable number. These topics will involve such knowledge and appreciation of plot, character development, and other qualities of style and treatment as may be fairly expected of boys and girls. In grammar and rhetoric the candidate may be asked specific questions upon the practical essentials of these studies, such as the relation of the various parts of a sentence to one another, the construction of individual words in a sentence of reasonable difficulty, and those good usages of modern English which one should know in distinction from current errors.

The second part of the examination will include composition and those books comprised in the list headed *study*. The test in composition will consist of one or more essays, developing a theme through several paragraphs; the subjects will be drawn from the books prescribed for *study*, from the candidate's other studies, and from his personal knowledge and experiences quite apart from reading. For this purpose the examiner will provide several subjects, perhaps five or six, from which the candidate may make his own selections. The test on the books prescribed for study will consist of questions upon their content, form, and structure, and upon the meaning of such words, phrases, and allusions as may be necessary to an understanding of the works and an appreciation of their salient qualities of style. General questions may also be asked concerning the lives of the authors, their other works, and the periods of literary history to which they belong.

The preceding pages embody the report of the Conference verbatim. That report is somewhat more full than earlier ones; but the changes made in college entrance requirements are few and slight. The grouping of the classics from which selections are to be made for general reading is changed, and there are a few additions and omissions. No specific instructions are given as to the selection, arrangement or teaching of either required or recommended classics. The statement relating to grammar and composition, while somewhat expanded and fairly specific with regard to the kind of work to be done, leaves the teacher to determine the relative proportions of each part, the necessary equipment, personal and material, and the principles and methods to be observed. Some of these matters are touched upon in the general discussion following, beginning on page 14.

#### FOURTH-YEAR COURSE.

According to the preceding recommendations for the three-year course in English, it is intended to occupy five recitation periods weekly for that time, in the general proportion of two recitations weekly in composition to three in classics. This total number of recitations or class exercises may of course be distributed through the four years of a high school course, four recitations a week, if for any reason that arrangement seems desirable. The Conference report makes no provision for a full four-year five-recitation course in English, but the University of Kansas has provided that any accredited high school of the state, may, with the approval of the High School Visitor, add to the three-year course recommended by the Conference a fourth year of English, the work to constitute an additional entrance unit, and the character of it to be arranged with reference to the conditions of the school wishing to offer it. In order that this fourth entrance unit may be accepted instead of an equivalent college unit after entrance, it should consist of either English literature or English composition; and the following are suggested as possible courses under each head, five recitation periods weekly:

1. **ENGLISH LITERATURE.** The study of English literature of the seventeenth century and earlier, beginning with a historical survey of the field, and including the reading of Old English verse in translation, of selections from Chaucer and Spenser, and of seventeenth century classics, prose and verse, not included in the course of the first three years. With this study there should be regular theme writing, not less often than once a month. Such a fourth year of literature may be organized and systematized with the literature of the preceding three years by simply arranging for the reading of a greater number of the classics listed, with some few additions. One such possible arrangement is shown hereinafter, on page 21.

2. **ENGLISH COMPOSITION.** The study of such types of discourse as afford the best opportunity for review and further study of the several discourse forms, narrative and descriptive, expository and argumentative, with daily practice in preparing material suitable for each type, and in adapting it, with especial reference to the nature of the person or public addressed, to all purposes and occasions for which such speaking or writing is demanded. With this study there may be, instead of a text book or to supplement it, free use of illustrative material consisting of literary selections exemplifying such types as are chosen. Some re-

cent textbooks make such illustrations a part of the text; a number of these, and other books consisting wholly of illustrative material, are named on page 13.

If a fourth entrance unit in English is offered, it is required that the entrance certificate show the nature of it in full detail. Such a unit, if accepted will excuse the student from a corresponding part of the English of his freshman year.

*Supplementary recommendations of various committees on college entrance requirements.*

The primary aim of the Conference report is to state with the utmost clearness the nature of the results desired from the high school training in English, and to leave teachers absolutely free to secure these results in their own way. Specific suggestions as to methods and details are intentionally omitted, because it would be impossible to make any such suggestions that would apply in all cases, and the effort so to apply them would result often in failure and consequent harm. But there is an insistent demand from individual teachers for specific advice or prescription on every possible point; and in response to this demand a few supplementary recommendations have been made from time to time, with intent not so much to satisfy the demand as to make still clearer the general meaning and intent of the original recommendations. Among the earliest of these supplementary recommendations was the following group:

1. That English be studied throughout the primary and the secondary school courses, and when possible for at least three periods a week during the four years of the high-school course.

2. That the prescribed books be regarded as a basis for such wider courses of English study as the schools may arrange for themselves.

3. That where careful instruction in idiomatic English translation is not given, supplementary work to secure an equivalent training in diction and in sentence-structure be offered throughout the high-school course.

4. That a certain amount of outside reading, chiefly of poetry, fiction, biography, and history, be encouraged throughout the entire school course.

5. That definite instruction be given in the choice of words, in the structure of sentences and of paragraphs, and in the simple forms of narration, description, exposition, and argument. Such instruction should begin early in the high-school course.

6. That systematic training in speaking and writing English be given throughout the entire school course. That in the high school, subjects for compositions be taken partly from the prescribed books and partly from the student's own thought and experience.

7. That each of the books prescribed for study be taught with reference to: (a) The language, including the meaning of words and sentences, the important qualities of style, and the important allusions. (b) The plan of the work, *i. e.*, its structure and method. (c) The place of the work in literary history, the circumstances of its production, and the life of its author. (d) That all details be studied, not as ends in themselves, but as means to the comprehension of the whole.

To these recommendations the following paragraph on grammar was afterward added:

"The student should have a sufficient knowledge of English grammar to enable him at need to point out the syntactical structure of any sentence which he encounters in the prescribed reading. He should also be able to state intelligently the leading grammatical principles when he is called upon to do so. Whether this knowledge is obtained in the elementary school and the secondary school combined, or only in the elementary school, is immaterial, provided the student have it; but in most cases it cannot be acquired except through regular study and practice in the lower grades, and scarce through these. A progressive and regular development of the grammar sense, from the lowest grades to the highest, is much to be preferred, to a sudden and unprepared-for injection of formal grammar at a particular stage, as, for example, in the eighth grade."

With reference to the teaching of composition, teachers have been advised in still other recommendations that composition work should be oral as well as written, that such work should be continuous throughout the entire high-school course, and that textbooks in rhetoric or composition are by no means essential to successful training, and are to be used with great discretion.

The substance of many of these supplementary recommendations has been embodied by the University in the following explanatory statement hitherto printed in the catalogue immediately after the description of the three-year entrance requirement as already outlined:

"It is intended that teachers shall be left free to secure the indicated results in whatever way may prove most suitable, and in particular to substitute for the books named others of equivalent literary value and of similar types, or to add others to the list.\* Hence it is impracticable to describe or to define precisely what should be done in any one year or in any one term; but a few suggestions may be made, to be followed at discretion.

"It is preferable to carry on the subjects side by side, in the proportion of two recitations a week devoted to composition, grammar, and rhetoric, to three devoted to literature; the study of composition to include the writing of one or two exercises every week, and the discussion of these exercises to be made the means of reviewing the principles of grammar as well as those of rhetoric; textbooks to be used chiefly for reference, if at all.

"GRAMMAR. If students do not enter the high school with such a practical knowledge of grammar as will enable them, on occasion to name and classify parts of speech, explain the structure of sentences, and state and apply principles, the subject should be further studied in connection with the work in composition, and, if necessary, there may be a brief formal review at some stage of the high-school course.

"COMPOSITION AND RHETORIC. The textbook in rhetoric is to be regarded merely as an aid in the study of composition and of literature. Exercises in composition should be oral as well as written, and should be continuous through the high-school course. Subjects should be derived partly from the literature read by the class and partly from the student's own observation and experience. The order of advance may be: First, stories; the finding and shaping of descriptive and narrative material in easy, spontaneous expression. Second, essays; study of

\*See fifth paragraph below.

theme, plan, and paragraph. Third, the general principles of style; the sentence and the word. Fourth, the general principles of form—narrative and description, expository and argumentative.

“LITERATURE. Textbooks in history, biography, and criticism are merely incidental aids in the study of classics, and, like those in rhetoric, should rarely, if ever, be made subjects of formal recitation, except in reviewing. It is desirable that, of the books read in the high-school course in literature, those of modern authors shall be taken up first, and that the order of types shall be such as will coordinate the study with that of composition. American literature, if included, may precede English, and the prose of any period may precede its verse. Reading done at home may be preceded and followed by class discussions and reports. At the end of the course there should be a chronological review, with a good textbook, of all the work that has been done, with a brief survey of earlier periods.”

In exercising the privilege, referred to in the fifth paragraph, preceding, of substituting one classic for another, care should be taken that the substituted books are books of the same kind as those replaced, that the course be not weakened, for instance by filling it over full of fiction or lighter verse. The important point is this: that when a strong course in classics is once established in accordance with the recommendations of the Conference, it is not necessary to change it whenever the Conference makes changes in its recommended list, unless the changes commend themselves as desirable and reasonably convenient. This they almost invariably do; but even then it may take two or three years to carry into effect a wise recommendation. See further, page 22 following.

To the preceding paragraph on composition and rhetoric should be added the following further note; the importance of which and the reason for making it are shown in the fuller discussion of composition teaching, pages 22 to 29: The especial attention of school officers and school boards should be called to the equipment needed for the adequate teaching of English composition. In such teaching there should be much practice in writing, rarely less than one one-paragraph theme of 150 words a week, and often five or six times as much; a fair general average probably much above 400 words a week. To read and criticize and correct such papers with care requires an hour or more for each 2000 words; to hold individual conferences requires not less than an hour for each five or six pupils. Theme reading taxes the strength of a teacher far more than does conducting recitations, and the limit of efficiency in it for a single teacher with other work to do besides is two or three hours a day. From these data it is obvious that for thorough work in English composition, a thoroughness especially necessary in high schools because few pupils will have further opportunity for the study, never more than one hundred pupils in all, fewer as the amount of written work increases, should be assigned to a single composition teacher: that the measure of the labor depends almost entirely upon the number of pupils and the number and length of themes, and only incidentally if at all upon the number of recitations; and that if the number of pupils to a teacher is greatly in excess of a fair assignment thus de-

terminated, satisfactory work cannot be expected, no matter how favorable may be other conditions.\*

#### TEXTBOOKS.

So great is now the number of good textbooks and reference books in English subjects that it is no longer practicable to specify any one as being the best of its class. Almost any recently published text will be found useful, and entirely satisfactory for the conditions it was designed to meet: but on the other hand it is impossible for any text to be satisfactory under all conditions; and the problem of the teacher, if free to choose, is to find the book that best suits the conditions of his own classes; or, if the book is prescribed, to adapt it to those conditions.

Editions of the classics listed in the preceding requirements for college entrance may be had of any educational publisher. For reviewing the history of English literature, beside standard reference works, a list of which follows, page 00, it is of advantage to have at hand in the school library a number of good textbooks for comparison; such as those of Pancoast, Halleck, Scudder, Moody and Lovett, Simonds, Newcomer, and Long. For the regular work of the classroom probably no better choice could have been made than that of the Moody and Lovett, and Boynton, adopted by the State Textbook Commission in 1909.

The number of textbooks in composition and rhetoric is increasing much more rapidly than that of texts in English literature, perhaps because a text in composition is almost indispensable, while a literature text may not be needed at all if the school library is well furnished. Good textbooks in composition and rhetoric, in the general order of publication, are those of Genung, Newcomer, Webster, Mead and Gordy, Scott and Denney (revised), Lockwood and Emerson, Smith and Thomas, Herrick and Damon (revised), Gardiner and Kittredge and Arnold, Kavanagh and Beatty, Espenshade, Huntingdon, Lamont, Shackford-Judson, Thomas and Howe, Brooks and Hubbard, Baldwin, and Canby. The Stebbins text, adopted by the State Commission, is a compend of excellent material which will under some circumstances require reorganization and adaptation by the teacher. In considerable demand at the present time are volumes of illustrative selections to accompany the formal text in composition; and the more recent of these are Nutter and Hersey and Greenough, Grose, and Berkeley; intended primarily for college use, but serving equally well for advanced high-school work. Also popular to lighten the labor of both teacher and class and to accompany a regular text are handbooks of rules and usages, such as those of Carson and Woolley.

Useful handbooks on methods of teaching classics are Heydrick's *How to Study Literature*, Blakeley's *Teacher's Outlines for Studies in English*, and Thomas's *How to Teach English Classics*. McMurry's *Special Method in the Reading of English Classics*, intended for grade

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\*The conditions of English composition teaching in the United States are now being made a subject of special investigation by a committee of the English section of the Modern Language Association; and the statement here made is based upon results already arrived at by that committee, which will make a complete report in the near future. Compare Bleyer's *High School Course in English*, published by the University of Wisconsin,

schools, is useful for high schools also. Of special excellence and practicality is Bleyer's *The High School Course in English*, covering all the English subjects of the course. It is published by the University of Wisconsin. Complete treatises on methods of teaching English subjects in general are Carpenter, Baker, and Scott, *The Teaching of English*, and Chubb, *The Teaching of English*. A few copies of the University Handbook on the Teaching of English are still for sale by Scott, Foresman & Co.; and the University theme and essay tablet is published by O. P. Barnes, Chicago.

New editions of classics, and new texts and references in all English subjects, are constantly appearing; and the best way to choose is to select from publishers' catalogues those which appear to be most likely to be suitable, and to write for copies for examination with the privilege of return. All educational publishers extend this privilege to teachers and school officers.

### GENERAL EXPLANATIONS.

*English Literature.* Within the limits of the recommended list of classics, the choosing of books to be read, the arranging of them, and the methods of study, are left to the teacher and must vary with circumstances. For this reason it is unwise to offer more than general or illustrative suggestions, since a plan or method that suits perfectly the conditions of one school or teacher may fail entirely under other conditions; but since every teacher must select and arrange and plan before beginning work, discussion and comparison of plans and methods is always profitable in so far as it serves to bring to light the underlying principles upon which all successful teaching must be based. A recent teachers' conference in Lawrence was especially fruitful in this respect. It emphasized the need of making of the entire high-school course in classics a strongly unified whole, organized with reference to a single consistent point of view, and with regard to all the possibilities of similarity of theme. All the classics may be studied as manifestations of the same human spirit under various conditions of time, place, and temperament; or as means to the understanding of ancient and modern conditions of life and ideals. Within the general grouping determined by the larger principle of unity, variety and contrast may be sought for, as for instance in date, literary type and style, and personal characteristics of the author. In making selection of books, the pupils' previous reading and training must be considered, the resources of the available library or libraries, and the possibilities of correlation with other subjects, especially with history and composition.

In a general way it may be advisable to study later writers before earlier ones, American before English, prose before verse, narrative and concrete literary types before those that are reflective and abstract, though conditions in particular cases may require inverting the order of these. The study of the criticism of an author should always follow the study of the work of that author; and sometimes the same rule may apply to biography as well as to criticism. Since all the possible principles stated cannot be operative at once, any selection or combination of them will serve that under the conditions of each case seems to be in conformity with the order of increasing interest and of the easiest approach to difficulties, and will at the same time coordinate the study

of classics with that of composition. But not everything is to be sacrificed to ease: the course must be interesting or it fails entirely, and the more difficult classics must be reserved till the class is prepared for them by its previous study; but the course must also have backbone; and in connection with each piece of literature and each type of literature, biography, chronology, and historical background should be kept clearly in view. The study of these, though incidental, results in a sense of the dignity, permanence and objectivity of literature, and anticipates and prepares for the brief historical review at the end of the course; brief because all the details have already been presented and need only to be gathered up and summarized.

Preceding numbers of this Bulletin and of the University catalogue have, in response to frequent requests from teachers, suggested courses in classics intended to be illustrative of these general principles and roughly indicating a division into parts corresponding to high-school years. But, as already explained, such outlines can be of little direct service in shaping the work of any particular high school, because they necessarily fail to take account of details of local conditions. The division of the high-school English course into one-year units is, like other suggestions, purely tentative; the course, whatever it is, should be taught as a unit, and term and year divisions made wherever it happens to be convenient to make them.

Two of these suggested courses are reprinted herewith, one below, the other on page 21. The first of these is perhaps as simple a course as can be made from the options offered, except that Burke's Speech on Conciliation is retained because of its peculiar distinction and its adaptability for every sort of analysis; but for all but a few of the classics named alternatives may be substituted at pleasure from corresponding groups in the recommended list. In following the recommendations of the Conference it will rarely be found practicable or advisable to confine the class study to the books in list *b*. It will usually be found expedient, before beginning work upon the books listed "For Study," to spend some time upon a part of the fiction and later verse in the home reading list, to show such pupils as may need it how the home reading and study may be carried on. To do this will be the more necessary and will take longer if the class has had no satisfactory training before entering the high school. Afterward, when this preliminary study of fiction and verse has been completed, and the pupil continues such reading outside of class while working in class on the books prescribed for careful study, the results of his outside reading should still be constantly tested by making it as often as necessary the subject of class discussions and of written reports and themes. Although not specifically mentioned in the reading list, the outside reading is always to include the biographical and historical matter relating to the authors, the texts, and the periods represented.

Arranged in general accordance with the principles that have been stated, the following order of study has been suggested for the classics listed for examination, 1910 to 1915.

## IN CLASS.

## OUT OF CLASS.

*Fiction.*

Hawthorne.—House of the Seven Gables. Begin in class, finish outside if necessary.

George Eliot.—Silas Marner, after completing Hawthorne. Contrast American and English traits, and compare the Vicar of Wakefield as illustrating earlier fiction.

*Verse.*

Lowell.—Vision of Sir Launfal. Compare American with English verse, later with earlier.

Burns.—Selections, from Palgrave; preparatory to Carlyle's Essay.

Coleridge.—The Ancient Mariner. Goldsmith.—Deserted Village.

Gray.—Elegy.

Reference and other collateral reading as required.

*General Prose.*

Carlyle.—Essay on Burns. Study for style and method as well as for interpretation, with comparisons such as previously suggested.

Irving.—Sketch Book.

Emerson.—Selected Essays; or Thoreau.—Walden.

Lamb.—Essays of Elia; or

Addison.—De Coverley Papers.

*Public Address.*

Burke.—Speech on Conciliation.

Extended reference reading.

*Earlier Verse and Prose.*

Milton.—L'Allegro, II Penseroso.

Bunyan.—Pilgrim's Progress, part I.

Bible Selections (list, group I.)

*Drama.*

Shakspeare.—Macbeth.

Shakspeare.—Two selected plays.

*General historical review.*

In this outline, the first year's work might include the class study of fiction, verse, and essay, leaving a part of the outside reading in these to be done later. The second year might be given to Burke and the earlier verse and prose exclusive of Shakspeare; and the third to Shakspeare and the historical review. Shakspeare and Milton might of course be interchanged, and the general order might otherwise be varied in any way that will best serve the general end of making the work interesting without sacrifice of positive results.

The preceding arrangement is such that as a rule no classic is read at home until part of it or until a similar one has been studied in class. The purpose of this is to insure a fuller appreciation of the books read at home. That the pupil may in his class-study have passed on to another type of literature, does not make any difficulty. When a classic has been assigned for home reading, a recitation period may be spent in the preliminary discussion of it, and essay subjects relating to it may then be assigned; when the home reading of it is completed at least one or two recitation periods may be spent in reviewing it, and some of the essays may then be presented in class. Whenever time presses, a longer classic, the reading of which has been begun in class, may be completed

out of class, provided always that the teacher sees to it that, by means of final discussion or otherwise, the work shall be understood as a whole, and that its literary or artistic unity shall be the chief thing to be impressed on the minds of the pupils

The class study of literature is intended to be much more thorough, and therefore much more critical, than the collateral home reading. It must be systematic, and yet no single system or method can be made to apply to all the books studied. Indeed, it might be said that if a method of study proves satisfactory with one book or class, or in the hands of one teacher, that is an excellent reason why it is not likely to be satisfactory with another book or class or teacher. Yet the general province of the critical study of literature may be broadly indicated, the field within which somewhere must lie the work to be done upon any single book, author, type, or period.

At the basis of all study of classics lies the fundamental fact that the book to be studied exists solely and simply as in some sense a communication from the author to a reader or some body of readers; except as a means of communication, expressing the play of the author's mind, reflecting his personality and attitude, and conveying to the reader whatever it may of interest or purpose or influence, intended or otherwise, it has little claim to attention. Interpretation of the substance of the message is then the first thing necessary with such specific study of the means of expression as is requisite to make this interpretation more complete. After that may follow the study of the author as shown in and through his work, of the extent to which he has succeeded in his general purpose, of the reception and influence of his work, and of its comparative literary value as determined by degree of accomplishment of the end in view and degree of acceptance by individual readers and by the public generally.

It must be strongly emphasized that the field here indicated is far too broad to be covered in the study of any single classic, or except as to some more salient points, in an entire school course; and the most serious mistake to be made in teaching a classic is that of "teaching it to death." Better to leave the classic to speak for itself than at any time to over-do the matter of interpreting and drawing inferences. But by beginning with classics that are attractive in themselves, and by judiciously opening new avenues of interest as the course advances from one to another, the entire course—Burke, Milton, and all—may become a way of perpetual delight; no small part of the pleasure proceeding from the consciousness of a gradually increasing power in interpreting writings, and a gradually increasing sensibility to all that is in and behind them. Further, though it is a mistake to overdo the teaching of a classic, it is likewise a mistake to ignore the limitless opportunities each new classic offers for illustrating new possibilities of interpretation, and to sacrifice all those opportunities by confining attention to the doing of a few conventional things, the asking of a few stereotyped questions, or the requiring of essays on a few worn-out subjects. Interpretation is more than looking up words in a dictionary, criticism is more than repeating or memorizing meaningless platitudes about style, and there are numberless things that are usually better worth doing in class themes than making "abstracts of the story" and "analyses of the characters," though these have their place and value.

Interpretation and appreciation, if the terms are rightly understood, may include in themselves practically all that the study of a classic may strive for; and in the study of what is meant by interpretation and by appreciation, in relation to the classic regarded as a communication, the general possibilities of the teaching of classics may be fully shown. First of all, of course, we must know the substance of the thing written, the author's thought or feeling or purpose as conveyed therein. To find this is what we commonly call interpretation, and to find it we first look up words and allusions and translate figures of speech into literal language, and so on. But the greater or more important or more significant part of an author's intended meaning may be, and in some degree some part of it always is, conveyed purely by suggestion, to be read "between the lines" only. After we fully understand what is said, some part, perhaps the best part, of the intended thought may be still to seek. Then again, after this is sought for and perhaps found, there still remains a part of the communication to be read, a part perhaps not intended to be read, but perhaps for that reason all the more interesting—the thousand hints as to the character and personality and environment of the man himself, as to the cause and the purpose of all that he has done, and as to the reasons why he has done it in just that way.

The study of interpretation, therefore, must deal with what is implicit as well as with what is explicit; with that which is directly and intentionally implied and with that which is matter of unintended but still inevitable inference. But after thus extending the scope of interpretation, we have not yet begun to exhaust the possibilities of the study of subject matter. There remains the analysis of thought-form and the study of all the possible relations of the subject matter: these relations, including its classification, source, shaping influences, and results; each to be known partly by inference from the subject matter itself, and partly by making use of opportunities for "outside investigation" and reference reading that shall be genuinely investigative and critical, and therefore genuinely worth while. Such outside investigation should wait till it suggests itself in response to an insistent desire to find out more about certain things. In beginning study the thing to do next is usually the thing that the class wishes to do next, probably because it is new and for that reason interesting; but skilful leadership by the teacher will easily insure that at the end of a course the results accomplished will fairly cover the field. More mature students may of course be set to solve definite critical problems in a systematic way.

Complete interpretation of a classic requires the study of suggestion and of the means of suggestion. It requires also the drawing of inferences and hence the study of the data of inferences. Here are additional study fields to work in at the proper time. Among the means of suggestion or the data of inference, or both, are all the phenomena of style and structure; and a class is ready for the study of these phenomena when its previous practice has prepared it to use them in interpreting and in drawing inferences; when the study of them will help to throw light on writing and author. At some time, later rather than earlier in the course, the leading phenomena of style and the chief principles of structure or method in relation to specific literary types may be systematically reviewed; but they are never to be studied as of any im-

portance in themselves, apart from their function in conveying meaning, justifying inferences, and aiding to bring about results.

Through the study of the matter of the message and of the style and form in which that matter finds expression, one may come into more or less intimate personal knowledge of the man behind the book—the author; may estimate the work he intended to accomplish in writing it, pass opinion on the means he used to that end as more or less suitable, and measure the success of his work through the study of its effect or influence upon individual members of an individual class, and upon readers in general; and here is a place where the collateral study of biography and history is legitimate and stimulating, serving to verify or to correct the pupil's own inferences on biographical and historical points. Last of all there is a place for the profitable study of critical opinion; to compare it with class or individual opinion, and to ascertain from it to what extent a book has successfully served the intended purpose, to what extent its message has been accepted, what results have followed, and why. The literature of critical opinion may also serve, in the final step of an infinitely vast and varied course of study as a part—important, but not the only part—of the evidence on which must be based the final estimate of the literary merit of the work studied; and even here, before that evidence is introduced or considered, the class and its several members should have formulated singly, and again by agreement, their own independent estimate of value and artistic excellence, with the reasons for it, and should be able to support those reasons by abundant illustration whenever they admit of illustration.

Everything that has been discussed up to this point may be regarded as belonging in some sense within the province of interpretation. But the delight in knowing the author of a book, grasping his motive and purpose, understanding the means he uses, in consciously and intelligently and justly exercising one's individual right to like or dislike, to accept or reject, to be entertained or moved to sympathy or spurred to action, to judge of effectiveness and artistic merit and add an honest vote to the ultimate consensus of critical opinion—all this belongs likewise to appreciation. Appreciation has not been taught, it is true; it is a truism that it cannot be taught. But it has developed without any need of teaching; and that development is inseparable from the things that have been taught if they have been taught rightly; the thing most to be desired as a result of the teaching of literature will inevitably be present from beginning to end of our teaching if we teach well. With many pupils the appreciation of literature is strongly marked in the beginning of formal study, and such pupils add charm to a teacher's work; with many others it is the merest spark, to be as easily extinguished as kindled to larger fire. In all these cases fuller development is possible, and is reasonably certain if the teacher himself is appreciative, tactful, and wise.

If the preceding suggestions seem to imply that the study of literature must necessarily be a wholly laborious and heavy and therefore repellent occupation, it should again be stated, and with increased emphasis, that this is a serious mistake. To study even a small part of the indicated field might of course be the work of a lifetime; and to undertake to do more than touch it here and there in any particular school course is absurd. But that is no reason why any class should not be free to work at will

in what it regards as the most interesting and attractive parts of the field; no reason why it should be confined to certain things only, when its privileges are without limit. It is as inexcusable to kill the interest of a class by doing the same things over and over interminably—as by always writing the same sort of theme on the same sort of topics, or by always looking up the same sort of information in answer to the same sort of questions—as it is to kill it by undertaking to do things that lie entirely beyond the power and capacity of the class, or by undertaking to do too many things. To realize the richness and charm as well as the vastness of the possibilities of the study of literature, and then to lead the class wisely according to its capacity and interest, without stopping merely to mark time and thereby to waste it, is all that can be expected of any teacher. To know that the world is large need not discourage any one from taking a walk in the nearest wood, or from taking a new path when the old one becomes so familiar as to lose interest, or from visiting a new part of the country now and then; the usual result of such knowledge is to rouse a desire for broader acquaintance with the world, even if one cannot expect to see it all.

The substance of what has been said in this connection may be summed up in the following list of what may be called “points of attack” upon a classic:

1. General interpretation of meaning, stated, suggested, or implied; and the drawing of inferences from all possible data as to occasion and purpose of the work and its central teaching.

2. At a suitable time, the illustrative study of the style of certain authors, selections, or passages, to show what style means, and how the study of it may aid in interpretation.

3. In contrasting one literary type with another, the study of some of the leading principles of method in each.

4. In completing the study of an author, the bringing together of all hints and inferences derived from preceding study as to his personality and character; the reasons for his style, his attitude toward his work, his choice of subject and of form.

5. At the proper time, the study of the historical place and basis and influence of the classic.

6. With every classic, after reviewing matters of special interest noted during preceding study, the endeavor to select the best parts and passages and to formulate a general estimate of its literary quality and value.

Naturally the first and last of these will have attention in the study of any classic; the others whenever there is occasion for it; and the critical and investigative possibilities under each are infinitely varied, every classic suggesting new topics for discussion, usually so interesting that it is necessary to take care that the study of incidental matters does not divert attention from the main purpose of the work.

A good four-year course in English literature may be made simply by arranging for the reading of a greater number of the classics listed for the three-year course, with some additions. Such a course, revised from a preceding Manual, is outlined below. Year divisions may correspond roughly to the successive centuries indicated. The accompanying composition work of the first three years may be the same as that of the three-year course (see page 28); for the fourth year it may consist of regular theme writing,

## FOUR-YEAR ENGLISH LITERATURE COURSE.

## NINETEENTH CENTURY.

*American Fiction; the short story.*

Part of this may have been given in the grades; if so, omit or substitute.

## IN CLASS.

Irving.—The Sketch-book.

## OUT OF CLASS.

Selections from  
Hawthorne.—Twice Told Tales.  
Poe.—Tales.

*American and English Fiction; longer works compared with short stories.*

(If any part read in the grades, omit or substitute.)

Hawthorne.—House of the Seven Gables, begun. One other book selected from fiction group in entrance requirement list.

Hawthorne.—House of the Seven Gables, completed. Other books from fiction group in entrance requirement list.

*American Verse.*

(Books interchangeable at pleasure, and so below.)

Lowell.—Vision of Sir Launfal.

Longfellow.—Courtship of Miles Standish.  
Whittier.—Snowbound.

*English Verse; compared with American.*

Coleridge.—Ancient Mariner.

Burns.—Selections, from Palgrave's Golden Treasury (to precede Carlyle's Essay, below.)

Other books from poetry group in entrance requirement list.

*American Prose.*

Irving.—Essays from the Sketch Book.  
Lincoln.—Selections.

Thoreau.—Walden.  
Parkman.—Oregon Trail.

*English Prose.*

Carlyle.—Essay on Burns.

Stevenson.—Inland Voyage and Travels with a Donkey.  
Thackeray.—English Humorists.  
Macaulay.—Essays on Lord Clive and Warren Hastings.

## EIGHTEENTH CENTURY.

*Fiction.*

Goldsmith.—Vicar of Wakefield.

Johnson.—Rasselas.  
Defoe.—Robinson Crusoe.

*Verse.*

Goldsmith.—Deserted Village.

Selections from Cowper, Gray, Collins, Dryden, in Palgrave's Golden Treasury.

*General Prose.*

Burke.—Speech on Conciliation.

Franklin.—Autobiography.

Addison.—Sir Roger de Coverley Papers.

## SEVENTEENTH CENTURY.

*Verse.*

Milton.—Minor Poems.

Milton.—Selections from Paradise Lost.

Selections from Palgrave.

*Drama.*

Shakspeare.—Macbeth.

Shakspeare—Selected plays.

*Prose.*

Bacon.—Selected Essays.

Bunyan.—Pilgrim's Progress.

Old Testament selections, from translation group of entrance requirement list.

Old Testament selections, from entrance requirement group.

## EARLIER LITERATURE.

Chaucer.—Prologue.

Chaucer.—Selections from Canterbury Tales.

Spenser.—Selections from Faerie Queene.

Selections from Old English, in translation.

## HISTORICAL REVIEW.

The purpose of this outline, as of the three-year outline preceding on page 16, is to illustrate the application of a definite principle of organization, not in any sense to prescribe what that principle shall be. But that there must be a specific principle or plan of some kind is obvious. In some high schools the existing English course has no other justification than tradition and the inconvenience of making a change. Such courses may sometimes be recognized by a preponderance of fiction (only two or at most three books are recommended in the Conference list) and perhaps of more recent verse, and by a confusion of classics of all types and periods in each of the successive years of the course. To reorganize a defective three-year course requires the cooperation of all the English teachers and the school officers for three years of time. If an ideal three-year course be planned, only the first year of it can be introduced at once, for the second- and third-year students who have had the old course must have their work shaped with reference to what they have already done; and not till the third year after introduction will the new course be completely in effect. Hence the introducing of it must be made a matter of permanent policy. Once in effect, it may be freely modified in detail to suit individual classes and teachers without affecting the basic principle, or creating any sort of inconvenience.

*English Composition.* The correlation of the studies of composition and of classics consists not only in carrying them on side by side, but in making use of the classics read to illustrate principles of expression which pupils may apply to their own speech and writing, in assigning subjects which will require independent critical reading of books in hand, or reading for information on special topics, and, so far as is convenient, in keeping to the same general order of subjects in both studies, so that the

work done in each may reenforce that of the other. Abstracts and summaries of books read should never be required as composition exercises except when absolutely necessary, as they hinder the growth of that independence of view which is essential in the critical study of literature. To maintain and develop ease and originality of expression, fully half of the composition exercises should be based on the student's experience; that is, on his present or past observation; and on occasion exercises may be partly or wholly imaginative.

Composition and rhetoric are not to be regarded as distinct subjects in the high school course. A rhetoric is merely a textbook in composition; and in the study of composition, as in that of literature, the use of formal textbooks is purely an incidental matter. The principal part of the work must always be the preparation and discussion of oral and written exercises. Such an exercise of some kind, longer or shorter, should be a part of every lesson, and probably at least one exercise every week should be a written exercise of some length.

Points that may be successively considered in a course in composition are: the structure of discourses, of paragraphs, and of sentences, the choice and use of words, and the nature and more general principles of narration and description, exposition and argument. Throughout the course, the most important objects to keep in view are the securing of easy and spontaneous expression, and the adapting of material to the person or public addressed. To emphasize these at all stages of the course and especially at its beginning, the letter form is most useful. The work may well begin with the preparation of stories—that is, of narrative or descriptive exercises based on observation or imagination; then may follow the preparation of essays presenting reflective material derived from all sources, and the study of theme, plan, and paragraphs; then, with any sort of material or treatment, may be taken up the study of sentences and words, and the general principles of style; and finally, the general principles of all forms of discourse, and in particular of narrative and exposition, may be considered with appropriate material and exercises. Any textbook may be found suitable and helpful; but no textbook should be followed too closely, and no topic or exercise assigned if there is no better reason for assigning it than that it is to be found in the book.

Under no circumstances should a period be spent in memoriter recitation upon any text; if there can be no practical illustrative exercise of any kind, the study of rhetorical theory is of little worth except for such incidental aid as it may furnish toward the appreciation of literature, and this is sure to be too little for the time expended. Often the work in composition may be done to the best advantage without the use of any text or texts whatever, except for reference, and in reviewing.

The fundamental difficulty in the teaching of English composition is largely independent of the character and method of the training, and arises wholly from the fact that English composition is in the fullest sense a laboratory subject, not, however, requiring an expensive special equipment like chemistry or manual training, but only a sufficient number of teachers to make it possible to give individual attention to all pupils that need it. In a large proportion of the high schools of this as of every other state, not to speak of schools below or above,

it is often under existing conditions a physical impossibility to teach English composition at all without breaking down the teacher. When English expression was regarded as a textbook subject, requiring little practice, if any, it was easy to teach, for no great amount of labor was required of either teacher or pupils; and results, if there were any, came from the general influence of association and precept upon pupils who presumably had some taste and literary ambition to begin with and were earnestly trying to advance. But when, about thirty-five years ago, the study of rhetoric began to give place to the study of English composition, one of the easiest courses in a school curriculum became the heaviest of them all, cruelly and crushingly heavy for teachers, because of failure to recognize the enormous amount of time and labor required for theme reading and conferences with pupils. For instance, a teacher who under the old system could without difficulty carry 150 pupils, under the new might find it necessary to add to the regular hours of teaching six to eight hours a day of theme reading; sometimes even more than this. School officers and school boards are sometimes careless and sometimes ignorant as to these conditions; less often, like the teachers themselves, they are simply helpless. But the conditions must be recognized and as far as possible provided for, in order that English composition teaching may be made something more than a pretense without sacrificing the health, eyesight, and ambition of the teachers in charge.

Extended investigation of many schools for many years has established with definiteness the conditions necessary for efficient teaching of English composition. It is agreed that the subject requires constant practice in expression, and that a large part of this practice, perhaps more than half of it, should be oral; but that the minimum amount of written work from each student cannot well be less than from 150 to 200 words a week, while the maximum, depending upon the kind of work and the pupil's interest in it, may be fully ten times as much. A general average for all kinds of work and all conditions is found to be above 400 words a week. It is also agreed that with average pupils under average conditions, all this work should be carefully examined by the teacher, corrected as thoroughly as may be necessary, and if falling below a certain standard, rewritten and re-examined. It is agreed further that not less often than once a month the teacher should hold a private conference of ten or fifteen minutes with such pupils as need it, to give direct personal advice and help.

Even the mention of these things makes it evident that they are not all possible in many high schools at the present time; but further and still more precise details must be considered. The rate at which a teacher can read and correct manuscript varies from below 1000 to above 5000 words an hour, according to the kind and quality of the work and the skill of the reader; but the average rate for all schools, teachers, and conditions is about 2000 words. For beginning classes in high schools, which are also the largest classes, it is below 1500 words. The rate increases with improvement in quality of work done; and it is of course much greater for general inspection than for close criticism and correction. But the general average stated is based upon hundreds of reports extending through many years, and its accuracy approaches that of an insurance statement of death rate.

Equally definite and essential as a condition of composition teaching is the optical and physiological limit of the time that can be spent daily in reading manuscript. For continued full efficiency this limit is below two hours a day. At three hours a day, fair efficiency can be maintained for a limited time, if other duties are not too heavy. More than three hours a day is a correspondingly shorter cut to physical collapse and nervous breakdown; numerous instances of which appear in the records upon which these statistics are based.

With these data, a simple computation shows that under none but exceptional circumstances should any high-school English teacher be placed in charge of more than 100 beginning pupils\* when these are doing the minimum amount of writing—150 words a week; and that this number should be diminished as the course advances. If, as often happens, this number is exceeded, then the teacher cannot be held responsible for failure to show satisfactory results; and it is unjust to require or expect or even to permit a teacher under such circumstances to work extra hours beyond the standard of other teachers, at night and on holidays and Sundays, in a suicidal attempt to secure such results. *In fixing the work of an English composition teacher, the number of recitation hours is a purely subordinate factor in the problem; the matter of supreme importance is the total number of pupils assigned to that teacher.*

To find what this number should be in any individual case is a simple matter. Besides one hour a day devoted to conferences, a possible two hours may be effectively spent in manuscript reading, or ten hours a week. If the teacher's reading rate for a class is 1500 words an hour, and each member of the class averages 150 words a week, then, as above stated, the class may consist of 100 pupils, in as many sections as the teacher is to have recitation hours daily. If there are five sections of 20 pupils each, the teacher will then have a total labor day of eight hours. But if each of five sections consists of 30 pupils, and each pupil is so interested in his English composition that he writes 500 or 600 words a week, and the teacher reads at the rate of 2500 words an hour, the reading alone may require seven hours a day, in addition to teaching time. Such a situation is not unusual, but it is little short of criminal, since it must result in killing either the teacher or the work; possibly both. In such a case, if 400 words a week is the proper average amount from each pupil, and if the teacher can read it thoroughly at the rate of 2000 words an hour, the total number of pupils for that teacher should be 50 instead of 150.

While the right of self-preservation justifies an English teacher in refusing to read manuscript more than a reasonable number of hours daily and weekly, English teachers know that their work has to meet a test to which no other branch in any school or college is subject. The language which a student uses in speech or in writing is at all times under critical inspection by everybody; and even a conscientious teacher

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\*One hundred pupils to a teacher as a maximum, in four sections, is recommended to the state high schools by the University of Wisconsin (Bleyer High School Course in English, p. 13.) In the freshman classes of the University of Wisconsin itself the maximum is sixty, in three sections; and the proposed maximum at Cornell University is twenty-five to a teacher.

who may incline to take a kindly school board at its word and neglect part of the composition work, will rarely be able to escape the charge of incompetence when that work begins to deteriorate. But conscientious teachers work for their pupils rather than their salaries, and however considerate may be the attitude of the school board, the rule is that, until strength utterly fails, teachers refuse to lower their standards. It is also unhappily and painfully true that not all school boards and school officers are considerate, because presumably not all are well informed on this vital point.

The amount of written work to be required of a composition class in a given time to accomplish desired results, while varying widely with conditions, is in no sense an arbitrary thing to be determined by the fiat of a school officer or the caprice or convenience of a teacher. It is fixed by the conditions in each case; but making all possible allowance for differences of conditions, it becomes feasible after sufficient experience to formulate something of a standard of practice. If, then, the work of a class is reduced materially below this standard, the time of the class is in part wasted, and the money expended on that class is therefore also in part wasted. Moreover, if a class is interested in its composition work, it will exert an upward pressure; it will always desire to write much more than is required or convenient, and if the extra work done is either discouraged or neglected, the interest will be destroyed. Hence a bad situation cannot be cured by simply lowering the requirement in composition, any more than by omitting it from the curriculum entirely. If real results are desired, they must come from real teaching with adequate practice.

Composition teachers should of course not overlook any means of lightening their work that will not necessarily reduce its efficiency; and they need to be on the watch for such opportunities. For instance, it is often advisable with beginning pupils, and sometimes with all other pupils, to give for a time entirely free rein to the desire for expression, without any limit as to quantity. The resulting manuscript may be handled in mass, without detailed individual criticism, by making a rapid examination to select typical specimens of good and of bad work, and exhibiting these on blackboard or bulletin board, without names, for public inspection and comparison by the pupils themselves. Even when the selected examples of good and bad are not accompanied with critical comment, the result of exhibiting them is likely to be the stimulating of every pupil to the keenest self-criticism, and the utmost care to keep his work from falling into the wrong class. Attractive and successful as this method may occasionally prove under suitable conditions, it affords a teacher no real relief, for it still requires the rapid examination of all the manuscripts; and a large part of the work done by backward pupils will always require careful reading. It can be used only now and then, if at all, and for short intervals; after which the work of individuals needs to be checked up with greater care than ever.

Again, it may be a grave waste of time for the teacher constantly to mark errors which arise not from ignorance, but solely from carelessness. All pupils should be held responsible for the practice of principles that have been studied till they are well understood by all, and the teacher should refuse to give any attention to work that is not as perfect as the pupil can himself make it. A formal but absolutely

fair list of requirements may be built up, increasing as the class advances, and publicly posted or perhaps printed for distribution, and it must be a list completely approved as fair by the class itself.\* Then if, for instance a pupil, having wilfully neglected to consult this list, hands in a paper without having taken time to punctuate it, the use of a wastebasket may be pardoned. But conversely it is unpardonable to use the wastebasket for the work of pupils that have met the requirements to the best of their painstaking ability; indeed, there is no surer way than this to develop carelessness where it has not previously existed. Even careless work should usually be marked "Refused," and returned to the pupil.

But however skilful the teachers and however brilliant the pupils, if teachers are too few and pupils too many, and if it is not possible to provide additional teachers, the subject of English composition must be slighted. It may be slighted till it becomes perfectly easy to teach, and perfectly worthless. The means of doing so are familiar, for there are few high schools, if any, in which some of them are not employed. The teacher may slight it, by omitting conferences with pupils, by omitting the re-writing of defective papers, by making an undue and perhaps theoretical increase in oral work and so reducing the requirement in written work much below the average based on experience, by reading only a part of the manuscript, by having the best pupils read some of it, by having the pupils exchange and read for one another, by leaving the manuscript altogether unread, and finally by turning the English class into a class in literature and having no manuscript written. These are arranged in a descending scale of values till in the last two we reach the absolute zero. The last named alternative is a fairly popular one; but strange to say work thus done, even as a literature course, is still almost valueless. Experience has led teachers of English literature to require written reports and exercises with increasing frequency, to develop and test the pupil's power to think, and to ensure that the subject shall have a practical as well as a culture value.

In emphasis and summary of the central points of the preceding discussion, the first and essential requisite for a good high-school course in English is an adequate number of teachers, rightly proportioned to the number of pupils as has been indicated. If there are not enough teachers the work cannot be held up to a worthy standard; its deficiency may be unavoidable, but it is not for that reason any less unfortunate. Better no English course at all than a course that must either be partly or wholly a pretense or else break the teacher's health and professional ambition. The facts that have been stated about theme writing and theme reading can be dealt with only by accepting or by deliberately disregarding them; they cannot be disproved, nor can they be discounted; for every fact has been stated conservatively. On the other side of the account there is just one item; that the conscientious teacher of English composition who elects to sacrifice himself in the effort to do the work of two, wins from pupils the highest appreciation that ever comes to any teacher of any subject; and it is this great reward

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\*Such a printed list is used in Central High School of Kansas City, Mo., by Mr. W. W. Douglass.

that holds the best of such teachers to their chosen work, even when the conditions are most hopeless and the scrap heap is most near.

The composition subjects suggested at the beginning, page 23, may in that general order be combined with the literature course outlined on page 16, as follows (the arrangement by years is purely discretionary):

#### FIRST YEAR.

##### *Literature.* (Three periods weekly.)

IN CLASS.

OUT OF CLASS.

##### *Fiction.*

Hawthorne.—House of the Seven Gables.

Eliot.—Silas Marner, and others, after Hawthorne (see p. 16)

##### *Verse.*

Lowell.—Vision of Sir Launfal.  
Burns.—Selections.

Coleridge.—The Ancient Mariner.  
Goldsmith.—Deserted Village.  
Gray.—Elegy.

##### *General Prose.*

Carlyle.—Essay on Burns.

Irving.—Sketch Book.  
Emerson or Thoreau.  
Lamb or Addison.

##### *Composition.* (Two periods weekly.)

The finding, shaping and adapting of material in oral and written exercises: letters, stories, essays; study of theme, plan, and paragraph.

#### SECOND YEAR.

##### *Literature.* (Three periods.)

##### *Public Address.*

Burke.—Speech on Conciliation.

Reference reading, and first-year outside reading finished.

##### *Earlier Verse and Prose.*

Milton.—Minor Poems (except Lycidas).

Bunyan.—Pilgrim's Progress.  
Bible Selections.

##### *Composition.* (Two periods.)

The principles of style in oral and written exercises: letters, stories, essays; study of sentence structure and of choice and use of words, study of paragraphs, translation, synonyms, figures, verse forms.

#### THIRD YEAR.

##### *Literature.* (Three periods.)

##### *Drama.*

Shakspeare.—Macbeth.

Shakspeare.—Two plays.

General historical review.

*Composition.* (Two periods.)

The forms of discourse: letters, stories, essays; study of the nature and principles of narration and description, exposition and argument.

This outline does not undertake to suggest any special order of the various kinds of possible composition exercises, but only a possible order of topics to be successively considered. The exercises themselves may be infinitely varied, and shaped always to rouse or satisfy the interest of the class. Long exercises and short ones, oral and written, prose and verse, letters, stories, articles, speeches, essays, book material and experience material, material produced for quantity and material produced for quality, everything that anybody can think of as having any possible relation to the future mental life of the members of the class on either its practical or its imaginative side may be interchanged at the pleasure of class and of teacher; but under it all there will be a systematic even if unsuspected development of topics, and a fair degree of coordination with the course in classics.

If a high-school English course taught by a number of teachers is well organized, it is obvious that each teacher must clearly understand the plan of the whole, and the relation to it of his own particular part; and to this end teachers themselves should hold frequent conferences with one another. English teachers should also be in touch with the work of teachers in allied departments, such as those of history and ancient or modern language, in order to utilize to the full material afforded by those departments. Finally, it should be remembered that, in all schools of every rank, although general practice contradicts the principle, the beginning classes need the best teachers, those having the finest skill and the broadest experience; and equally important and equally uncommon, they need to have enough of them. If the beginnings of composition teaching are made thorough by means of adequate equipment with competent teachers, difficulties higher up will disappear of themselves.

But the number of teachers must be adequate, else the competency of individuals will be of little avail; and experienced teachers are not to be blamed for being averse to working under conditions which must render skilled effort fruitless. Nothing is more greatly needed in relation to the new movement in education than a revival and reform in English composition teaching—in teaching the practical and effective use of the mother tongue. But no step in advance is possible till tradition is set aside once for all and present intolerable conditions remedied by providing English with the additional percentage of teachers physically and mathematically necessary to give real and effective training to a determinate number of pupils, in all schools from grades to college, but especially in the secondary schools.

*BOOKS FOR THE ENGLISH LIBRARY.*

For the study of English the only laboratory required is a well-equipped library. The following list of books has been prepared in reply to many inquiries as to what such a library should contain in addition to dictionaries and standard editions of the works of English writers. Besides collections of prose and verse, the list includes classified titles of valuable reference works in seventeen or more subjects

belonging to English literature, English composition and English language. Books of special importance in each group are marked each with an asterisk, and the books so marked are for the most part inexpensive. Teachers may consider these first when the library purchase must be limited to a small number. Groups and authors are in alphabetical order.

## I. AMERICAN LITERATURE.

- Bowen.—Makers of American Literature; Neale Publishing Company, 1908; \$2.50.  
 \*Cairns.—Selections from Early American Writers (1607-1800); Macmillan, 1909; \$1.25.  
 Carpenter.—American Prose; Macmillan, 1898; \$1.  
 Fisher.—A General Survey of American Literature; McClurg, 1899; \$1.  
 \*Holliday.—History of Southern Literature; Neale Publishing Company, 1906; \$2.50.  
 Newcomer.—American Literature; Scott, Foresman & Co., 1902; \$1.  
 Onderdonk.—History of American Verse; McClurg, 1901; \$1.25.  
 Otis.—Early American Verse; Moffat, Yard & Co., 1909; \$1.75.  
 \*Page.—Chief American Poets; Houghton, 1905; \$1.75.  
 \*Pattee.—History of American Literature; Silver, Burdett & Co., revised, 1909; \$1.20.  
 \*Richardson.—American Literature; Putnam's, 1891; \$3.50.  
 Sears.—American Literature in Its Colonial and National Periods; Little, Brown & Co., 1902; \$1.  
 Simonds.—Students' History of American Literature; Houghton, 1909; \$1.10.  
 \*Stanton.—Manual of American Literature; Putnam's, 1909; \$1.75.  
 \*Stedman.—An American Anthology; Houghton, 1900; \$2.  
 \*Stedman.—Poets of America; Houghton, 1885; \$2.25.  
 \*Trent.—History of American Literature; Appleton, 1903; \$1.40.  
 Trent.—Southern Writers; Macmillan, 1905; \$1.10.  
 \*Tyler.—History of American Literature During the Colonial Time; Putnam's, 1878; \$3.  
 \*Tyler.—Literary History of the American Revolution; Putnam's, 1897; 2 vols, each \$1.50.  
 \*Wendell.—Literary History of America; Scribner's, 1900; \$3.  
 White.—Philosophy of American Literature; Ginn; 1891; 30 cents.

## II. BIOGRAPHIES.

- American Men of Letters, Series; Houghton; each \$1.25.  
 English Men of Letters Series; early issues, Macmillan; each 40 cents.  
 English Men of Letters Series; later issues, Macmillan; each 75 cents.  
 Great Writers Series; W. Scott, London; each about 75 cents.  
 Great Writers Series; cheaper edition, W. Scott, London; each 40 cents.  
 Hinchman and Gummere.—Lives of Great English Writers—Chaucer to Browning; Houghton, 1908; \$1.50.  
 Vedder.—American Writers of Today; Silver, Burdett & Co., 1895.  
 \$1.50.

## III. COMPOSITION; EXPOSITION, ARGUMENT, AND DEBATE.

- Alden.—Art of Debate; Holt; 1900; \$1.  
 \*Brookings and Ringwalt.—Briefs for Debate; Longmans, 1896; \$2.25.  
 \*Foster.—Argumentation and Debating; Houghton, 1907; \$1.25.  
 Laycock and Scales.—Argumentation and Debate; Macmillan, 1904; \$1.10.  
 Mitchell and Carpenter.—Exposition in Classroom Practice; Macmillan, 1906; 70 cents.  
 Pattee.—Practical Argumentation; Century, 1909; \$1.10.  
 Perry.—Argumentation; American Book Company, 1906; \$1.  
 Perry.—Exposition; American Book Company, 1908; \$1.  
 Thomas.—Manual of Debate; American Book Company, 1910 (announced.)

## IV. COMPOSITION; GENERAL WORKS.

- Baldwin.—College Manual of Rhetoric; Longmans, 1903; \$1.35.  
 \*Baldwin.—Composition, Oral and Written; Longmans, 1909; \$1.20.  
 \*Bates.—Talks on Writing English, first series; Houghton, 1896; \$1.50.  
 \*Bates.—Talks on Writing English, second series; Houghton, 1901; \$1.30.  
 \*Berkeley.—A College Course in Writing from Models; Holt, 1910; \$1.25.  
 Cairns.—Forms of Discourse, revised edition; Ginn, 1909; \$1.15.  
 Canby, Seidel and others.—English Composition in Theory and Practice; Macmillan, 1909, \$1.25.  
 Carson.—Handbook of English Composition; World Publishing Company, 1907; 65 cents.  
 \*Gardiner.—Forms of Prose Literature; Scribner's, 1900; \$1.50.  
 \*Scott and Denney.—Paragraph Writing, revised edition; Allyn & Bacon, 1910.  
 Seward.—Note Taking; Allyn and Bacon, 1910; 50 cents.  
 Taylor.—Composition in Narration; Holt, 1910; 75 cents.  
 Thomas and Howe.—Composition and Rhetoric; Longmans, 1908; \$1.20.  
 Tompkins.—Science of Discourse; Ginn, 1897; \$1.  
 \*Wendell.—English Composition; Scribner's, 1891; \$1.50.  
 \*Woolley.—Handbook of Composition; Heath, 1908; 80 cents.  
 Woolley.—Mechanics of Writing; Heath, 1909; \$1.

## V. CRITICISM AND REPRINTS.

- Arber Reprints, The.—Macmillan; each about 35 cents.  
 Balfour.—Questionings on Criticism and Beauty; Oxford University Press, 1910; 70 cents.  
 Bartlett.—Familiar Quotations; Little, Brown & Co., latest edition; \$3.  
 \*Bates.—Talks on Teaching Literature; Houghton, 1905; \$1.30.  
 Bates.—Talks on the Study of Literature; Houghton, 1897; \$1.50.  
 Bray.—History of English Critical Terms; Heath, 1898; \$1.  
 \*Brewster.—Literary Criticism; Macmillan, 1907; \$1.10.  
 Carpenter and Brewster.—Modern English Prose; Macmillan, 1904; \$1.10.  
 Cooper.—Theories of Style; Macmillan, 1907; \$1.10.

- Craik.—English Prose; Macmillan, 1893-'96; 5 vols.; each, \$1.10.
- Dickinson and Roe.—Nineteenth Century English Prose; American Book Company, 1909; \$1.
- Everyman's Library, a growing series of reprints, now numbering about 450 vols.; Dutton; each, 35c.
- Gayley and Scott.—Introduction to the Materials and Methods of Literary Criticism; Ginn, 1899; 2 vols. each \$1.25.
- Johnson.—Elements of Literary Criticism; American Book Company, 1898; 80 cents.
- Manly.—English Prose (1137-1890); Ginn, 1909; \$1.50.
- McLaughlin.—Literary Criticism; Holt, 1893; \$1.
- Pancoast.—Standard English Prose; Holt, 1902; \$1.50.
- Pollard.—Their Day in Court (criticism of modern novels); Neale, 1909; \$3.
- Saintsbury.—History of Literary Criticism; Dodd, Mead & Co.; 1901-'03; 3 vols., each \$3.50.
- Saintsbury.—Loci Critici (illustrative passages); Ginn, 1903; \$1.
- Sears.—Principles and Methods of Literary Criticism; Putnam's, 1898; \$1.25.
- Sherman.—Analytics of Literature; Ginn, 1893; \$1.25.
- Shuman.—How to Judge a Book; Houghton; 1910 (announced.)
- Smith.—Function of Criticism; Oxford University, 1898; 35 cents.
- Vaughan.—English Literary Criticism, and other volumes of the Warwick Library; Scribner's, 1896; \$1.50.
- \*Winchester.—Principles of Literary Criticism; Macmillan, 1900; \$1.50;
- Wylie.—Evolution of English Criticism; Ginn, 1894; \$1.
- \*Woodberry.—Appreciation of Literature; Baker & Taylor, 1907; \$1.50.

## VI. DRAMA.

- Bates.—The English Religious Drama; Macmillan, 1893; \$1.50.
- \*Caffin.—Appreciation of the Drama; Baker & Taylor, 1908; \$1.50.
- Crowley, T. J.—Character Treatment of the Mediaeval Drama; University Press (Notre Dame), 1909; \$1.
- Hale.—Dramatists of Today.—Henry Holt & Co., 1905; \$1.50.
- Hennequin.—Art of Play-Writing; Houghton, 1908; \$1.50.
- Mackaye.—The Playhouse and the Play; Macmillan, 1909; \$1.25.
- Matthews.—A Study of the Drama; Houghton, 1910; \$1.50.
- Matthews.—Development of the Drama; Scribner's, 1904; \$1.25.
- Matthews.—The Studies of the Stage; Harper's, 1894; \$1.
- McEwan.—Freitag's Technique of the Drama; Scott, Foresman & Co.; 1895; \$1.50.
- \*Price.—Technique of the Drama; Brentano, 1892; \$1.50.
- Thorndike.—Tragedy; Houghton, 1908; \$1.50.
- Woodbridge.—The Drama; Allyn & Bacon, 1898; 80 cents.

## VII. GENERAL LITERATURE; REFERENCE WORKS IN.

- Brand and Ellis.—Popular Antiquities; Bohn Library, Bell & Sons; 3 vols., each \$1.50.
- \*Botta.—Handbook of Universal Literature; Houghton, latest edition: \$2.
- Gosse, editor.—Literatures of the World Series; Appleton; each vol. about \$1.50.

- Gostwick and Harrison.—Outlines of German Literature; Holt, 1873; \$2.
- \*Green.—Short History of the English People; American Book Company, 1896; \$1.20.
- Hosmer.—Short History of German Literature; Scribner's, 1891; \$2.
- Hudson.—History of Journalism in the United States; Harper's, 1873; \$5.
- \*Lollee.—History of Comparative Literature (trans. by Power); London, Hodder & Stoughton, 1906; about \$2.
- Millar.—Literary History of Scotland; Scribner's, 1903; \$4.
- Ploetz.—Epitome of Universal History; Houghton, latest edition; 1905; \$2.
- Saintsbury.—Short History of French Literature; Oxford University Press, 1882; \$2.60.
- Saintsbury, editor.—Periods of European Literature; Scribners; a series, each vol. \$1.50.
- Strutt.—Sports and Pastimes of the English People; London, Chatto & Windus, 1898; about \$1.
- Walker.—Three Centuries of Scottish Literature; Macmillan, 1893, 2 vols., each \$2.

### VIII. GRAMMAR AND LANGUAGE HISTORY.

- Abbott.—Shaksperian Grammar; Macmillan, 1896; \$1.50.
- \*Bradley.—Making of English; Macmillan, 1904; \$1.
- Carpenter.—English Grammar; Macmillan, 1906; 75 cents.
- Champney.—History of the English Language; Macmillan, 1893; \$1.25.
- \*Clodd.—Story of the Alphabet; Appleton, 1900; 35 cents.
- Craik.—English Literature and Language; Stokes, 1877; 2 vols., \$2.
- Earle.—Philology of the English Tongue; fifth edition, Oxford University Press; \$2.
- \*Emerson.—History of the English Language; Macmillan, 1894; \$1.24.
- \*Jespersen.—Growth and Structure of the English Language; Lemcke & Buechner, 1906; \$1.
- Jespersen.—Progress in Language; Macmillan, 1894; \$1.90.
- Kellner.—Historical Outlines of English Syntax; Macmillan, 1892; \$1.40.
- Krapp.—Elements of English Grammar; Scribner's, 1908; 80 cents.
- \*Leonard.—Grammar and Its Reasons; A. S. Barnes, 1908; \$1.50.
- \*Lounsbury.—History of the English Language; Holt, 1894; \$1.12.
- Morris.—Historical Outlines of English Accidence; revised by Kellner and Bradley; Macmillan, 1895; \$1.40.
- Nesfield.—English Grammar, Past and Present; Macmillan, 1898; \$1.10.
- Oertel.—Lectures on the Study of English; Scribner's, 1902; \$3.
- Scott and Buck.—English Grammar; Scott, Foresman & Co., 1906; 60 cents.
- Skeat.—Principles of English Etymology, first series; Oxford University Press, second edition, 1892; \$2.25.
- Skeat.—Principles of English Etymology, second series; Oxford University Press, 1891; \$2.50.

- Soames.—Introduction to the Study of Phonetics (the Victor), Swan, Sonnenschein & Co., 1889; about \$1.75.  
 Sweet.—History of Language; Macmillan, 1900; \$1.00.  
 Sweet.—New English Grammar, part I; Oxford University Press, 1892; \$2.60.  
 Sweet.—New English Grammar, part II; Oxford University Press; 1898; 90 cents.  
 Sweet.—Primer of Spoken English; third edition; Oxford University Press; 90 cents.  
 Sweet.—Sounds of English; Oxford University Press, 1908; 60 cents.  
 Toller.—History of the English Language; Macmillan, 1900; \$1.10.  
 West.—English Grammar; Macmillan, 1894; 60 cents.  
 Wyld.—Elementary Lessons in English Grammar; Oxford University Press, 1909; 50 cents.  
 Wyld.—Growth of English; Dutton, 1907; \$1.  
 Wyld.—Historical Study of the Mother Tongue; Murray, 1906; about \$2.

# IX. LANGUAGE; GENERAL REFERENCES.

- Earle.—English Prose; Putnam's, 1890; \$4.  
 \*Fernald.—Connectives of English Speech; Funk and Wagnalls, 1903; \$1.50.  
 \*Fernald.—Synonyms, Antonyms, and Prepositions; Funk and Wagnalls, 1897; \$1.50  
 \*Greenough and Kittredge.—Words and Their Ways in English Speech; Macmillan, 1901; \$1.10.  
 Hartog.—Writing of English; Oxford University Press, 1907; 60 cents.  
 \*King's English; Oxford University Press; second edition, 1906; \$1.75.  
 \*Krapp.—Modern English, Its Growth and Use; Scribner's, 1909; \$1.25.  
 Lounsbury.—English Spelling and Spelling Reform; Harper's, 1909; \$1.25.  
 \*Lounsbury.—Standard of Pronunciation in English; Harper's, 1903; \$1.20.  
 Lounsbury.—Standard of Usage in English; Harper's, 1908; \$1.50.  
 Mackey.—Pronunciation of 10,000 Proper Names; Dodd, Mead and Co., 1901; \$1.  
 March.—Thesaurus Dictionary; Historical Publishing Company, 1902-'03; \$15.  
 \*Phyfe.—Twelve Thousand Words Often Mispronounced; Putnam's, latest edition; \$1.25.  
 Roget.—Thesaurus of English Words and Phrases; Lippincott, 1856; \$1.50.  
 \*Skeat.—Etymological Dictionary of the English Language; Oxford, University Press; third edition, 1908; \$11.  
 Soule.—Dictionary of English Synonyms (ed. Howison); Little, Brown & Co., 1894; \$2.  
 Vizetelly.—Desk-book of Errors in English; Funk and Wagnalls, 1906; 75 cents.

## X. LITERATURE; HELPS IN STUDY AND TEACHING.

- \*Blakely.—Teachers' Outlines for Studies in English; American Book Company, 1908; 50 cents.
- \*Carpenter, Baker and Scott.—The Teaching of English; Longmans, 1903; \$1.50.
- Chubb.—The Teaching of English; Macmillan, 1902; \$1.
- Crawshaw.—Interpretation of Literature; Macmillan, 1896; \$1.
- Fleming.—How to Study Shakspere; Doubleday, Page & Co., 1902-'03; 4 vols., each \$1.
- \*Gayley.—Classics Myths in English Literature; Ginn, 1893; \$1.65.
- Guerber.—Legends of the Middle Ages; American Book Company, 1896; \$1.50.
- Guerber.—Myths of Greece and Rome; American Book Company, 1893; \$1.50.
- Guerber.—Myths of Northern Lands; American Book Company, 1895; \$1.50.
- \*Heydrick.—How to Study Literature; Hinds, Noble & Eldridge, 1902; 75 cents.
- Painter.—Elementary Guide to Literary Criticism; Ginn, 1903; 90 cents.
- \*Ryland.—Chronological Outlines of English Literature; latest edition, Macmillan, 1907; \$1.40.
- \*Skinner.—Myths and Legends of our Own Land; Lippincott, 1896; 2 vols., each \$1.50.
- Thomas.—How to Teach English Classics; Houghton, 1910; 15 cents.
- \*Whitcomb.—Chronological Outlines of American Literature; Macmillan, 1894; \$1.25.

## XI. LITERATURE; HISTORIES OF.

- \*Brooke.—English Literature from the Beginning to the Norman Conquest; Macmillan, 1898; \$1.50.
- Brooke.—History of Early English Literature; Macmillan, 1892; \$2.50.
- Cambridge.—History of English Literature; Putnam's; 14 vols., each \$2.50.
- Engel.—History of English Literature; Dutton, 1902; \$3.
- Garnett and Gosse.—History of English Literature; Macmillan, 1903; 4 vols., each \$6.
- \*Gosse.—History of English Literature in the Eighteenth Century; Macmillan, 1891; \$1.
- \*Long.—English Literature, Textbook of; Ginn & Co., 1908; \$1.35.
- Morley.—English Writers; Cassell, 1887-'95; 11 vols., each \$1.50.
- Newcomer.—English Literature, Textbook of; Scott, Foresman & Co., 1906; \$1.25.
- Saintsbury.—Elizabethan Literature; Macmillan, 1887; \$1.50.
- \*Saintsbury.—History of Nineteenth Century Literature; Macmillan, 1896; \$1.50.
- \*Saintsbury.—Short History of English Literature; Macmillan, 1898; \$1.50.
- \*Schofield.—English Literature From the Conquest to Chaucer; Macmillan, 1906; \$1.50.

- Simonds.—English Literature, Textbook of; Houghton, 1902; \$1.25.  
 Taine.—English Literature; Holt, 1871; \$1.40.  
 \*Ten Brink.—History of English Literature; Holt, 1893-'96; 3 vols., each \$2.

## XII. LITERATURE; SPECIAL WORKS.

- \*Bascom.—Philosophy of English Literature; Putnam's, 1874; \$1.50.  
 Beers.—History of English Romanticism in the Nineteenth Century; Holt, 1901; \$1.75.  
 Crawshaw.—The Making of English Literature; Heath, 1907; \$1.25.  
 \*Gosse.—History of Modern English Literature; Appleton, 1898; \$1.50.  
 Hales.—Handbooks of English Literature; Macmillan; a series, each vol. about \$1.  
 Jusserand.—Literary History of the English People; Putnam's, 1894; 3 parts published, each \$3.50.  
 Perry.—English Literature in the Eighteenth Century; Harper's, 1883; \$2.  
 \*Scudder.—Social Ideals in English Letters; Houghton, 1898; \$1.75.  
 Sylvester.—English and American Literature; Bellows, 1907; 10 vols., \$18.  
 Traill.—Social England; Putnam's 1894-'97; 6 vols; each \$3.50.  
 \*Tucker.—The Foreign Debt of English Literature; Macmillan, 1907; \$2.  
 Wendell.—Temper of Seventeenth Century in English Literature; Scribner's, 1904; \$1.50.  
 \*White.—Philosophy of English Literature; Ginn, 1895; \$1.

## XIII. NOVEL.

- Baker.—Guide to Fiction; Macmillan, 1903; \$2.50.  
 Burton.—Masters of the English Novel; Holt, 1909; \$1.25.  
 Crawford.—The Novel, What It Is; Macmillan, 1893; 75 cents.  
 \*Cross.—Development of the English Novel; Macmillan, 1899; \$1.50.  
 Dixon.—Guide to Fiction; Dodd, 1897; \$2.  
 Dunlop.—History of Fiction, Bohn Library; Bell & Sons, 1888; 2 vols., each \$2.  
 \*Hamilton.—Materials and Methods of Fiction; Baker & Taylor, 1908; \$1.50.  
 \*Horne.—The Technique of the Novel; Harper's, 1908; \$1.50.  
 \*Perry.—The Study of Prose Fiction; Houghton, 1902; \$1.25.  
 Raleigh.—The English Novel; Scribner's, 1894; \$1.25.  
 Stoddard.—Evolution of the English Novel; Macmillan, 1900; \$1.50.  
 \*Whitcomb.—The Study of the Novel; Heath, 1905; \$1.25.  
 Whitmore.—Woman's Work in English Fiction; Putnam's, 1910; \$1.25.

## XIV. PUNCTUATION.

- Bigelow.—Handbook of Punctuation; Lothrop, Lee & Shepard, 1893; 50 cents.  
 Chase, T. N.—Punctuation and Paragraphing; T. N. Chase, 1909; 15 cents.  
 De Vinne.—Correct Composition; Century Publishing Company, 1902; \$2.

- \*Perry.—Punctuation Primer; American Book Company, 1908; 30 cents.  
 Ramsay.—Principles of Modern Punctuation; R. L. Ramsay, 1909; gratis.  
 \*Teall.—Punctuation; Appleton, 1897; \$1.  
 Winchell.—Orthography, Etymology, and Punctuation; Flanagan, 1909; 60 cents.

## XV. SHORT STORY.

- \*Albright.—The Short Story; Macmillan, 1907; 90 cents.  
 Baldwin.—American Short Stories; McClurg, 1902; \$1.  
 \*Barrett.—Short Story Writing; Baker & Taylor, 1900; \$1.50.  
 Canby.—Book of the Short Story; Appleton, 1904; \$1.10.  
 Canby.—Short Story in English; Holt, 1909; \$1.60.  
 Chester.—Art of Short Story Writing; Publisher's Syndicate, 1910; \$3.50.  
 Cody.—World's Greatest Short Stories; McClurg, 1902; \$1.  
 \*Esenwein.—Writing the Short-Story; Hinds, Noble and Eldredge, 1909, \$1.25.  
 Gerwig.—Art of Short Story; The Werner Company, 1909; 75 cents.  
 Mabie.—Stories New and Old, American and English; Macmillan, 1908; \$1.50.  
 Matthews.—The Short-Story; The American Book Company, 1907; \$1.  
 Matthews.—The Philosophy of the Short-Story; Longman's, 1901; 50 cents.  
 \*Taylor.—Composition in Narration; Holt, 1910; 75 cents.

## XVI. VERSE; HISTORIES, COLLECTIONS, AND SPECIAL WORKS.

- \*Bronson.—English Poems; University of Chicago Press, 1905-'10; 4 vols., each \$1.50.  
 Brooke.—Studies in Poetry; Pitman, 1908; \$1.50.  
 Clark.—History of Epic Poetry; Simpkin, Marshall, Hamilton Company, 1900; about \$1.  
 Courthope.—History of English Poetry; Macmillan, 1903; 4 vols., each \$3.25.  
 Gummere.—Old English Ballads; Ginn, 1894; 80 cents.  
 Gummere.—Popular Ballad; Houghton, 1907; \$1.50.  
 \*Manly.—English Poetry; 1170-1892; Ginn, 1907; \$1.50.  
 \*Newcomer-Andrews.—Twelve Centuries of English Poetry and Prose; Scott, Foresman & Co., 1910; \$1.75.  
 Page.—British Poets of the Nineteenth Century; Sanborn, 1904; \$2  
 Pancoast.—Standard English Poems; Holt, 1899; \$1.50.  
 Saintsbury.—History of English Prosody; Macmillan, 1906-'08; 3 vols., each about \$3.50.  
 \*Schipper.—History of English Versification; Oxford University Press, 1910; \$2.90.  
 Stedman.—Nature and Elements of Poetry; Houghton, 1892; \$1.50.  
 \*Stedman.—Victorian Anthology; Houghton, 1895, \$1.75.  
 \*Stedman.—Victorian Poets; Houghton, 1887; \$2.25.  
 Symonds.—Romantic Movement in English Poetry; Dutton, 1909; \$2.50.  
 \*Ward.—English Poets; Macmillan, latest edition, 4 vols., each \$1.

## XVII. VERSE; STRUCTURE.

Alden.—Specimens of English Verse; Holt, 1903; \$1.25.

\*Alden—Introduction to Poetry; Holt, 1909; \$1.25.

\*Bright and Miller.—English Versification; Ginn, 1910; 80 cents.

Corson.—Primer of English Verse; Holt, 1892; \$1.25.

Gayley and Young.—Principles and Progress in English Poetry; Macmillan, 1905; \$1.10.

\*Gummere.—Handbook of Poetics; Ginn, 1885; \$1.

Lewis.—Principles of English Verse; Holt, 1906; \$1.25.

## Mathematics.

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The requirements in mathematics for admission to the College of Arts and Sciences, School of Law, School of Fine Arts, and School of Medicine of the University of Kansas, consists of one and one-half units of elementary algebra, and one unit of plane geometry. In the School of Engineering, an additional half-unit of solid geometry is required.

An additional half-unit of plane trigonometry and a half-unit of advanced algebra will be accepted by the University from such of its accredited schools as the High-school Visitor may certify are properly equipped to teach these courses.

The following outline of the course in mathematics was recommended by a committee appointed by the Kansas Association of Mathematics Teachers and approved by the mathematical faculty of the University.

1. One year of algebra, consisting of the following topics: Introduction, addition and subtraction, signs of aggregation, equations and problems, multiplication and division, type forms in multiplication and the factoring of the results, fractions and fractional equations, simultaneous equations, graphs and loci, involution, square root of numbers with a few polynomials, simplification of surds and quadratic equations.

The purpose of dividing high-school algebra into a year, to be given in the first-year high school, and then a half-year, to be given in the last half of the third year, is to adapt the kind of mathematics to the development of the pupil. Furthermore, since one year of algebra is all that is required in many high schools, so that many students get no more than the one year, it is desirable to make that one year as complete as possible, keeping a distinct aim in view.

In general, it is well to use the equation as a basis for that first year's work, and to give the student those parts of algebra essential for a good working knowledge of the equation. For that reason many problems requiring difficult manipulation of symbols should be omitted in the first year, to give time for other more essential principles.

The plan for the third term in algebra is to make the work much more abstract,—to teach it for its own sake, taking, as a basis, facility in the manipulation of symbols; and to that end give a course including difficult cases arising in the first year's work, such as parts of factoring and fractions, and the theoretic work in radicals, theory of exponents, quadratics, simultaneous quadratics and logarithms.

2. One year of plane geometry.

3. One-half year of solid geometry.

4. One-half year of elementary algebra, complete.

Detailed accounts of the topics required and suggestions as to the methods of teaching the various subjects are given below.

## ELEMENTARY ALGEBRA. One and one-half units.

The textbook in algebra adopted for the use of the Kansas schools is Marsh's Elementary Algebra. Since this book contains a larger amount of algebra than some classes can master in a year and a half under present conditions, some portions of it must be omitted, and it becomes necessary for the University to specify definitely just what portions may be omitted and just what portions must be mastered by the pupils in order to fulfill its requirements for admission.

The task is most easily accomplished by enumerating the paragraphs, exercises and chapters which may be omitted, and yet the pupils be fully prepared to enter the University classes. In this way the University lays down the essential things and the minimum amount of algebra which the preparatory schools must teach, but leaves them free to select such other topics as their time and local conditions may permit. But it is recommended that the high schools omit these designated topics and chapters from their course, and drill their pupils more thoroughly in the required topics.

These omissions and other suggestions are given in the following notes on the various chapters. Chapters not mentioned are to be taken entire.

*Chap. I.*—This chapter is very easy, but no part of it ought to be omitted for that reason. Exercises I, II, III, and IV, especially, should be given careful attention.

*Chap. II.*—Omit article 32 and all other articles and problems marked with a star throughout the book. Precede exercise XIII by a list of similar problems which do not contain signs of aggregation within other signs of aggregation.

*Chap. III.*—Omit article 51, problems 21-30, on page 37, problems 21-30 on page 45, and all of page 46.

*Chap. IV.*—In this chapter, solve every problem and check the result. Less attention should be given to the axioms than to the process of verification, because the latter is the only certain test of the correctness of a solution. It should be made clear to the pupil that the solution of a simple equation means the finding of a value of the unknown which will satisfy that equation. Too often pupils have the notion that it means going mechanically through a certain regular process which at the end gives the "answer." A habit of constant verification cannot be too soon encouraged, and the earlier it is acquired the more swiftly and almost automatically it is practiced.

Chapters I, II, III and IV are so elementary in their character and so suitable for younger pupils that they may well be taught in the grammar-school. The practical use and the disciplinary value of the methods of chapter IV are worth more to the pupil than all the compound proportion, bank discount, cube root, etc., that are contained between the covers of the old arithmetics. The notion that all problems in the school examinations should be "solved by arithmetic" is inexcusable pedantry.

*Chap. V.*—In solving examples 4 to 9, inclusive, of exercise XXX, the use of parentheses in the first expansion, as illustrated in the type example just above the exercise, should be insisted upon. The more difficult problems in each list of this chapter and all of page 74 may be omitted.

*Chap. VI.*—Omit pages 81-83 and 92-99. The remainder of this chapter on factoring is of fundamental importance and should be thoroughly learned. In connection with cases VI and VII the solution of equations of higher degree than the first by means of factoring might well be introduced. One or two lessons devoted to such work would be profitable and would compensate the effort by added interest. Exercise CXIII, page 272, could be used at this point. Care should be taken to select only such equations as have all the roots real.

*Chap. VII.*—This chapter contains two distinct method for finding the highest common factor, and two corresponding methods for lowest common multiple. Case I, viz., the method by factoring, is the only one that the ordinary student of mathematics will ever be called upon to use in his subsequent work. This method is easy, and should be mastered. Omit pages 103-110 and page 114.

*Chap. VIII.*—Many of the more difficult problems in this chapter may be omitted during this first course, but all should be taken in the second course. Omit 19-25 on page 117, 7-14 on page 119, 14 on page 123, and pages 133, 136, 137, 138, and 141 entire.

*Chap. IX.*—Omit 17-21 on page 146, and pages 152, 154, 155.

*Chap. X.* For the work in graphs, paper ruled in quarter-inch squares and sold usually in local stores at five cents for a "Student's Note Book" of about fifty pages, will be found very satisfactory. In teaching graphs the idea of locus should be emphasized. The pupil should learn to think of the graph as the path of a moving point which is restricted in its movement by the law stated in the given equation. In the development of the subject this is accomplished by making use of many questions similar to the following: "If a point be free to move except for the restriction that its  $x$ -coordinate shall always be equal to zero, where can it go?" "If a point be free to move except for the restriction that its  $y$ -coordinate shall always be equal to one, where can it go?" "If a point be free to move except for the restriction that its  $x$ -coordinate shall always be equal to its  $y$ -coordinate, where can it go?" etc. By means of such questions the pupil is led to conceive of the graphs of the equations  $x=0, y=1, x-y=0$  etc., as *lines of indefinite length*—a concept that is not so readily obtained in any other way. Again, emphasis of the locus idea gives the pupil power in seeing the relations of variables and the relative changes brought about by changes in the variables.

*Chap. XI.*—Probably one-half of each of the lists of problems in this chapter will give the student sufficient practice. Omit pages 182-187.

*Chap. XII.* Take entire chapter.

*Chap. XIII.* Omit entire chapter.

*Chap. XIV.*—Special attention should be given to the binomial theorem contained in articles 172 and 173. Solve all of the examples in exercise LXXXVII. In solving these examples insist upon the use of parentheses in the first expansion as illustrated in the type form given above the exercises. Omit articles 179 and 180. Special attention should be given to the finding of arithmetic square root, but no time should be wasted in introducing any work in cube root. The pupil will find out later that arithmetic roots higher than the second can be found much more easily by the use of logarithms.

*Chap. XV.* Take only pages 226-232. Omit from that point to page 268.

*Chap. XVIII.*—It is thought that the omissions indicated in the above outline will allow the teacher time during the first year to give a considerable portion of this chapter on the quadratic equation, at least pages 268-276 and some of the problems on pages 318-323.

It is recommended that the above course of one year be followed by a year or a year and a half of geometry so that the last half year of elementary algebra may come as late as possible. This course should begin with a thorough review of all the earlier chapters of the book, completing all work which has been omitted except the starred articles. These should all be omitted. The following pages may also be omitted: 141, 154, 155, 185, 187, 203-9, 219-21.

The major portion of the time during the half year should be spent upon chapters XV to XX. It is especially important for those students who intend to continue the study of mathematics that they should master thoroughly the contents of these chapters. Every portion of them is in constant use in the College courses in mathematics and physics.

*Chap. XV.*—Omit examples 22-27 of exercise CIII, all of article 202, and examples 42 and 44 of exercise CVI. In connection with exercise CV, it should be impressed upon the mind of the pupil that the new equation obtained by squaring or cubing the two members of a given equation will, in general, have roots that do not satisfy the given equation, and that, therefore, the checking of every solution is imperative. The author has pointed this out on page 245 and in example 2 on page 246, and it is deserving of emphasis.

*Chap. XVIII.*—Observe that emphasis is again laid upon the check in solving irrational quadratic equations. The method of factoring should be presented early, in order to show the character of the problem and the existence of the two roots. The pupil should clearly understand that relatively few simple problems are solvable by the method of factoring.

In order to avoid confusion of methods, it is best that the beginner be taught but one method of completing the square of a quadratic equation. Experience has shown that the method of completing the square after dividing through by the coefficient of  $x^2$  is the easiest for the pupil to remember. This method should therefore be taught, to the exclusion of all others. After the pupil has been thoroughly drilled in the above-mentioned method of completing the square, he should be taught the formula of article 225. He should be convinced by numerous examples that the quickest way to solve a quadratic equation is to use the formula. The pupil should habitually use the formula in his subsequent work whenever he has a quadratic equation to solve. The clear understanding gained by the use of graphs more than compensates for the time required to learn the graphical method.

*Chaps. XIX and XX.*—These chapters should be taken entire, except article 249.

*Chaps. XXI to XXIV.*—Omit.

*Chap. XXV.*—Give at least the practical application of logarithms.

## PLANE GEOMETRY. One unit.

The textbook in geometry for use in the high schools of Kansas is Bush and Clark's Elements of Geometry. Since the book contains a larger amount of geometry than the average class can master in a year

and a half, under the present conditions, some portions of it must be omitted. The University therefore recommends the following course:

#### FIRST HALF YEAR.

The work for the first half-year should extend to Chapter XII, omitting incommensurable cases.

The teacher can add interest to the work by seeing that pupils become acquainted with the history of some of the more important theorems. If possible, copies of Ball's and Cajori's histories of mathematics (both published by McMillan & Co.), should be at hand and the class be made familiar with them by references and assigned readings.

The original exercises are emphasized in the text and should be given as much time as possible. The average class ought to master from two-thirds to three-fourths of the exercises given. For use in problems of construction pupils should be provided with the following tools at the outset:

The Eagle compasses, No. 569 (price twenty-five cents.)

A hardwood ruler with inches and fractions on one edge and centimeters on the other edge (five cents.)

A German silver protractor (twenty-five cents), (paper ones, thirty cents a dozen.)

A hard drawing pencil (five cents.)

Every problem of construction should be carefully drawn on suitable paper, and as accurately as tools at hand will permit. With the simple outfit described above a very high degree of accuracy can be obtained. It is not enough for the pupil to learn the theory of geometric construction; he should also be taught how to apply the theory to actual practice. For example, it is not sufficient that the pupil be able to tell how to construct a square equivalent to the sum of two given squares, but he should be able to do it, and do it accurately and neatly. The accuracy of the result should be verified whenever possible by actual measurement. In the chemical or physical laboratory it is not regarded as sufficient that the pupils are able to tell how to do a certain thing; they must be able to do it. It should be the same in geometry.

#### SECOND HALF-YEAR.

Complete the plane geometry, omitting pages 127, 128, 129, and also 151, 153, 168, and 169. Omit all of chapter 20, and incommensurable cases.

One of the chief difficulties with what both teachers and pupils have to contend in the ordinary course in high-school geometry is that the pupils are called upon to acquire at one and the same time the elementary ideas of geometry, the terminology of geometry, and a knowledge of the nature and meaning of a logical proof. This difficulty would be largely overcome if these tasks were separated, so that the pupil could acquire his geometric ideas and vocabulary a year or more in advance of his undertaking the study of demonstrative geometry.

*Concrete Geometry in the Grades.*—As long ago as 1892 the Committee of Ten, influenced by the mathematical curriculum of the schools of continental Europe, recommended that systematic instruction in concrete (in-

tuitional nondemonstrative) geometry be given in the grammar grades. (See the Report of the Committee of Ten.)

Besides the above-mentioned difficulty in the teaching of the ordinary course in high-school geometry, there are weighty reasons for the introduction of some elementary geometry in the grammar grades. A very large percentage of the children in these grades never reach the high school. From their ranks is largely recruited the army of mechanics and skilled laborers of all kinds. A knowledge of the simpler facts of geometry is extremely useful in after-life to large numbers of people in this class. The public-school system should therefore be adapted to their needs and they should be given an opportunity to acquire in their school days this useful knowledge.

Concrete geometry is in its nature less abstract than many of the arithmetical theories usually taught in these grades, and is therefore better suited to the immature minds of the pupils than the more difficult processes of analysis which make up so large a part of the course in arithmetic.

*Blocks and Models.*—Mensuration is not the last topic that should be taken up in the course in arithmetic, but work on this subject should be carried on throughout the seventh and eighth grades. A good set of geometrical blocks and models can be used here with great profit to the pupil. Such a set can be purchased for a small amount.

The amount of geometrical knowledge to be acquired from such a set of blocks, or from the subject of mensuration illustrated by blocks, is a good preparation for high-school or demonstrative geometry.

*Geometrical Drawing.*—Closely connected with concrete geometry on the one hand, and on the other associated with the manual-training idea, is the subject of geometrical drawing. This might be taken up in connection with the work in free-hand drawing or in manual training. All the essentials of the course in concrete geometry advocated above might be given in a course in geometrical drawing.

*Textbooks in Elementary Geometry.*—There are a number of textbooks in concrete geometry on the market intended for the use of pupils in the grammar grades; a few of these are mentioned here. These books may be obtained from the publishers. Baker's Elementary Geometry, Ginn & Co.; Nichol's Introductory Geometry, Longmans, Green & Co.; Hornbrook's Concrete Geometry, American Book Company; Campbell's Observational Geometry, American Book Company; Dodd and Chance, Elements of Algebra and Geometry, Kimberly Publishing Company, Kansas City, Mo.; Hailmann's Constructive Form Work, P. C. Burchard & Co., Boston, Mass.

The last one mentioned is the best for young children in the lower grades. Baker's little book is one of the best of its kind for more advanced pupils and is well adapted for the upper grammar grades.

## SOLID GEOMETRY. One-half unit.

Solid geometry, one-half unit, is required for entrance to the School of Engineering, but is not required for entrance to the College of Arts and Sciences. If not offered for entrance to the College, it should be taken in the Freshman year. All accredited schools teach solid geometry, and so it is recommended that, as far as possible, candidates for admis-

sion to the College offer solid geometry for entrance.

For entrance to the School of Engineering it will be required that the student complete all of Bush and Clark's Solid Geometry as far as page 328, except that some of the problems on pages 323 to 327 may be omitted if the time be too limited. Give special attention to the algebraic side of the formulas.

In connection with the course in solid geometry the use of blocks and models is urged, and accurate drawings should be strongly insisted on. In this connection it will be found useful to have the pupils construct cardboard models of as many of the solids studied as is possible. Patterns for a large number of these models are to be found in Campbell's Observational Geometry (American Book Company).

#### FOURTH-YEAR MATHEMATICS

At present only a few high schools in Kansas gives courses in trigonometry or college algebra. Hereafter plane trigonometry and college algebra, one-half unit each, may be offered for entrance and counted among the fifteen units required for entrance. It is expected that this privilege will stimulate most of the stronger high schools of the state to introduce these courses into their curricula. Where both are taught, trigonometry should precede college algebra.

#### PLANE TRIGONOMETRY. One-half unit.

Ashton and March's Trigonometry is used at the University as the textbook for this course, and in amount of work and order of treatment the course in the high schools should conform to the plane trigonometry (pp. 1-115) of the above-named textbook, except that sections 24 to 28, inclusive, may be omitted. An equivalent amount of work taken from any standard text will be acceptable.

It is of fundamental importance that pupils obtain clear ideas of the trigonometric functions when they are presented. For that reason there should be some work with ruler and protractor at the first of the course. For example, to begin the course, develop by comparison of similar triangles the fact that in any right triangle the two acute angles and the six ratios of the sides are eight quantities so related that if any one of them is given the other seven are fixed. Pupils should then be given exercises in finding by actual measurement the ratios when an angle is given, and the angles and the other ratios when one of the ratios is given. They should next construct angles varying by five degrees from zero to ninety degrees and determine by measurement the approximate values of their trigonometric ratios. It will be found helpful to make the constructions upon squared paper. The results should be tabulated in the form of a table of natural functions and handed in for the instructor's examination. A reasonable amount of such work will be found very profitable.

It should be made clear to pupils that the use of logarithms is not *necessary* for the solution of trigonometrical problems, but that it is for convenience. They should be led to see that the use of logarithms, by substituting addition and subtraction for multiplication and division, economizes both time and labor. Problems, therefore, should be solved by use of the tables of natural functions before logarithms are introduced.

The study of the theory and use of logarithms should be taken up in connection with the trigonometry at the time it is needed.

### COLLEGE ALGEBRA. One-half unit.

A half-unit of college algebra should conform as closely as possible to the outline printed in the University catalogue under "Entrance to the College." The topic, *permutations and combinations*, may be omitted at the discretion of the teacher. All subjects involving infinite series should be omitted and the stress chiefly placed on complex numbers, determinants, the theory of equations, and their application.

In the solution of numerical equations, the roots should be located by means of the graph and their approximate values found by Horner's method. Sturm's theorem should not be given. The algebraic solutions of the cubic and quartic may be included if time permits, but they are not required.

### GENERAL REMARKS.

The modern tendency in mathematical instruction in secondary schools of the country is toward unification of the various branches of the science and its correlation with allied sciences. The teacher should always hold in mind that arithmetic, algebra and geometry are not separate sciences, but closely connected branches of one science, viz., mathematics. The arithmetic, algebra and geometry should be intermingled as intimately as possible. Many problems of algebra should be geometrical in character, and many problems in geometry should be solved by algebra. The unity and not the divergency of the science should be emphasized. In the high-school course mathematics and physics have contact at many points or, rather they interpenetrate each other in many regions. Both should be taught in such a way as to emphasize this relationship.

## The Organization of Barnes Law High Schools.

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Boards of education, principals of high schools and others interested in education have made frequent inquiries in the past with regard to the manner of organizing a Barnes law high school, and the standard and scope of work which should be maintained in order that they may comply with the provisions of the law. The act creating such high schools was passed by the legislature which convened in January, 1905, was amended at the regular session of 1907, and also at the special session which convened in 1908. No amendments were made by the legislature of 1909, but an act was passed legalizing all high schools established under this law, which had been maintained for at least one year, and which had been authorized by a *majority only* of all the *votes* cast on *said proposition*.

The amendment passed by the legislature of 1907 modified section 183 by requiring the county superintendent, on or before the 25th day of July, to certify to the county clerk the average daily attendance in each of the several high schools of the county complying with the provisions of the act and to certify to the board of county commissioners the *amount of money necessary for the maintenance of such high schools for the ensuing year*. This section also directs the *county commissioners to make such levy* as may be necessary to produce this amount of money. The maximum levy, however, must not exceed five-tenths of one mill. In case the county commissioners shall fail to make such levy then it becomes the duty of the county superintendent to make the requisite levy and to certify the same to the county clerk, who shall enter it upon the tax rolls of the county.

The legality of this section was questioned by the board of county commissioners in Allen county. The board of education of the city of Iola made application to the court to compel the county commissioners to levy a tax of five-tenths of a mill for the maintenance of the high schools of the county organized under the provisions of the Barnes law. The preemptory writ was refused by the court and the board of education appealed its case to the supreme court. The court reviews the case, June, 1910, and summarizes its argument as follows:

"Clearly it was the intention of the legislature that a fund should be provided for the support of the high schools, and every officer charged with the duty of enforcing the law in this respect should perform the duty imposed, as far as possible. The duty of estimating the amount necessary to maintain these schools suitably for the current year has been placed upon the county superintendent of public instruction, and that officer has the exclusive power to perform that duty. The county

commissioners have no power in the premises beyond making a levy. In this case five-tenths of a mill is the largest levy which they can make, but levy to that extent should have been made. The power of the county commissioners to levy taxes for the support of high schools, as stated in section 1 of chapter 397 of the laws of 1905, is superseded by the subsequent enactments of 1907 and 1909, which, being the latest expression of the legislature, must control.

"We do not concur in the view that chapter 333 of the laws of 1907 violates section 16 of article 2 of the constitution of the state.

"We conclude that the district court erred in not issuing the writ requiring the county commissioners to make a levy of five-tenths of a mill upon the dollar of the assessed valuation of the taxable property of the county, and the judgment is therefore reversed."

The question relative to the authority of the county commissioners to determine or change the amount necessary for the support of the schools as recommended by the county superintendent, is considered by the same court in an appeal from the district court of Wilson county. The county superintendent should determine the amount necessary to support the schools; the county commissioners shall make a sufficient levy to raise this amount to the limit of five-tenths of one mill. The summary of this opinion is quoted below:

"It thus appears that the county superintendent, in making the estimate of the necessary amount to be raised to support the high schools, may know with practical precision what it has cost to maintain the schools for the year preceding, and that officer is thus probably better prepared to make an estimate of the necessary expenses for the ensuing year than any other officer or officers of the county, not excepting the board of county commissioners. The legislature, probably recognizing this fact, imposed upon the county superintendent the duty of making the estimate and certifying certain facts, and upon the board of county commissioners the duty of levying a tax to raise the amount estimated. A specific duty is by statute imposed upon the county superintendent, and, if the act is valid, as we hold that it is, it imposes a specific duty upon the board of county commissioners, and does not leave that body any discretion in the matter.

"The legislative discretion involved in the levying of a tax has in this case been exercised practically by the legislature itself. It has prescribed a very low limit to the rate of taxation, and has prescribed upon what facts the commissioners shall act in levying a tax to such limit. It was said in *Commissioners of Wyandotte County v. Abbott*, 52 Kan. 148, on the authority of numerous cases from this court there cited:

"Where a legal duty is cast upon a board of county commissioners, that duty may be enforced by mandamus, and such duty cannot be evaded upon the ground that the county officials have a discretion to act." (Page 159).

"See also, *Hutchinson v. Leimbach*, 68 Kan. 37, 44.)

"We conclude that the court erred in sustaining the demurrer to the petition. The judgment is reversed and the case is remanded, with instructions to proceed in accordance with the views herein expressed."

The constitutionality of section 188 was questioned by the county treasurer of Marshall county, who refused to pay out money accruing

under the provisions of the law on the ground that the election was illegal. The schools, therefore, were not legally organized and the legislature had transcended its power in legalizing said schools, which had not been authorized by a majority of all votes cast at said election. This question has been before the supreme court for some time and probably a decision will be handed down in the October session.

Notwithstanding the legal entanglements which have, to a certain extent, obstructed the general application of this law, thirty-five counties had organized high schools under its provisions before January, 1910. A few counties have passed favorably upon it since that date and a number of schools have been organized. Exact numbers cannot be given at this time, but in all probability there are at the present time 150 schools working under the provisions of this law, employing 450 teachers and enrolling in the neighborhood of 8000 pupils.

The chief purpose of this article is to outline briefly the methods of organizing and equipping Barnes law high schools in so far as they relate to the University of Kansas. The first section of the law defines conditions upon which any school may be entitled to organize and thereafter participate in the Barnes law fund. Any county in which there are one or more districts or cities of less than 16,000 inhabitants, which shall have maintained high schools with courses of instruction admitting those who complete the same to the Freshman class of the College of Liberal Arts and Sciences of the University of Kansas, is eligible to vote upon this law and levy taxes for the support of the high schools. In section 2 it is provided that no levy shall be made until one or more such high schools shall have been maintained in the county the preceding year. When any district, therefore, shall have maintained a high school for at least one year, which offers at least thirteen units of prescribed college entrance work, such school is entitled to participate in any funds raised under the provisions of this law. The law does not provide that the course of study pursued prior to participation in county funds shall *fully meet* the requirements for college entrance. Conditional entrance was therefore adopted as the basis, which is thirteen units. The prescribed work of a school, therefore, should constitute the following units: Three units of either Latin or German, three units of English, two and a half units of mathematics, a half unit of either civics, physiography or solid geometry, one unit of history, one unit of biology, one unit of physics, and one other unit, which may be selected from the complete list of prescribed entrance units. The daily program should provide for forty-minute recitations and no teacher should be required to carry more than seven recitations per day. If the enrollment in the school does not exceed thirty or forty students it will be possible for two teachers to handle all the work of the high school, unless a wider range of subjects is offered than that indicated above. The school should also be provided with a small library of well-selected books, and also apparatus sufficient to conduct classes in biology, and at least one course in physical science.

Any high school that has maintained a course of study for at least one year, and including subjects as indicated above, is entitled to organize under the Barnes law, and section 8 enumerates some additional requirements which must be met before said school can participate in county funds. In the first place there must be two courses of

study. The first one is to be a college preparatory course, and the law states definitely that it shall fully prepare those who complete it to enter the Freshman class of the College of Liberal Arts and Sciences of the University of Kansas. This means that there must be at least fifteen units offered to all students who wish to prepare for college, since no student can enter the Freshman class unconditionally who has not completed fifteen units of secondary work. There must also be a general course of study offered for those students who do not intend to continue to study beyond the high school. This general course may consist of any work that the school board or the high-school teachers may require. In most of the schools it consists of the college preparatory course less the foreign language requirement, with probably the addition of some commercial or normal subjects. In case there are students who elect work in both courses, the number of classes will probably be so large that two teachers will be unable to handle all the work. This usually occurs when the enrollment reaches about forty students. Hence, as a general rule, a school which enrolls forty or more students and offers two distinct courses of study will require the entire time of three teachers,—the superintendent and two assistants. If the superintendent is allowed a portion of his time for inspection of grades, the work may be distributed as follows: Six recitations per day for each of the assistant teachers, and four or five periods for the superintendent. This is based on the supposition that the course of study does not require more than sixteen or seventeen recitations per day.

One of the most serious difficulties in the application of this law is found in the fact that no mention is made of the number of students which should justify the organization of a high school under the provisions of the Barnes law. A few school districts have taken advantage of this and have organized schools where the enrollment would not justify more than two or three years of regular high-school work, and some have gone so far even as to insist that the law only required a four-year course of study, regardless of whether there were pupils doing the work in all of the years or not. A few schools have enrolled only twelve students and the attendance in one school during the past year was reduced to seven students, who were being educated at a monthly expense of \$165. It will easily be understood that it would be impossible to conduct a good high school under such conditions and that the expense is far beyond all reason.

In such cases it would be wiser for the district to provide for the first two years of high-school work and thereafter send the few pupils who desire further educational advantages to the nearest first-class high school.

Many of the smaller districts have, unwisely we think, expanded the resources of the high school at the sacrifice of the grades. As a rule there should be four teachers in the grades before the fourth year is added to the high-school course, unless nonresident students are accommodated in the latter. Under no circumstances should the teaching force, efficiency or careful supervision be lessened in the grades in order that the high school be equipped to meet the requirements of the Barnes law. It would not only be good economy but it would also insure efficiency in high-school work if it were required that organiza-

tion be conditioned on an enrollment of at least twenty *bona fide* high school students. Statistics show that the number of students in the senior year of high-school work averages about one-sixth to one-seventh of the total enrollment. Should a school be required to reach an enrollment of twenty students it would be fairly reasonable to suppose that the senior class would be represented each year by not less than three students. Such a number would make it worth while to organize and maintain a fourth year of work. The University, therefore, does not recommend the organization of a school under the provisions of the Barnes law where there is not a fair prospect of enrolling from twenty to twenty-five students each year, or where the grades cannot, at the same time, be well provided for.

The past year has done much to popularize this law, and it is a safe prediction that when all classes become acquainted with its real significance and true worth to the community, it will be supported generously and opposition will cease.

The idea that its purpose is to compel the farming community to support high schools for the cities and towns has no foundation in fact. Its purpose is, in both theory and practice, to secure better and more advanced educational facilities for the county, and all the people in the county.

This claim is more than justified already in a number of counties where those living in rural communities have been far-sighted enough to unite with the city in support of an educational measure which opens the door of the high school to the country-school graduate, free of tuition. It is not uncommon to find a high school, first-class in all of its appointments, located in a town of a thousand inhabitants, or less, where fully one-half the enrollment enters from the rural school. Notice has just been received at this office from a Barnes law high school with an enrollment of 315 students, and exactly 100 of them are from the adjacent country districts; and this with three other high schools in the county. Such results as these would be practically impossible without county aid.

The Barnes law is destined to be a strong factor in the consolidation of rural schools by giving the people a voice through their county superintendent in secondary and higher education. No longer is the district school the finishing school for the country boy and girl. Early in their educational career these students begin to look upon the high school supported by the county as a part of their own educational program, only a step higher. The standards in these high schools will be made the standards in the district schools and the tendency will be more and more to articulate with them and cooperate with each other. Consolidation is neither more nor less than cooperation of several schools in the interests of better organization, better methods and more efficient administration. The urban and rural communities should support their schools with one accord, on the broad principle of equal opportunities for all.

The sections of the Barnes law which provide for the standardization and organization of high schools, in so far as they relate to the University, are quoted here for reference. For a complete copy of this law see Laws Relating to the Common Schools of Kansas, 1909,

a copy of which will be furnished by the Department of Education, Topeka.

"SEC. 178. In every county in the state of Kansas in which one or more school districts or cities of less than 16,000 inhabitants shall have maintained high schools with courses of instruction admitting those who complete the same to the Freshman class of the College of Liberal Arts and Sciences of the University of Kansas, the county commissioners shall levy a tax each year of not less than one-fourth of a mill nor more than three mills on the dollar of the assessed valuation of the taxable property within such counties for the purpose of creating a general high school fund.

"SEC. 179. .... Provided, no levy shall be made until one or more such high schools shall have been maintained in the county the preceding school year.

"SEC. 185. At least two courses of instruction shall be provided, each requiring four year's work, namely: A college preparatory course, which shall fully prepare those who complete it to enter the Freshman class of the College of Liberal Arts and Sciences of the University of Kansas; and a general course, designed for those who do not intend to continue school work beyond the high school."

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### The School of Education.

The School of Education began its work with the present college year. Its establishment bespeaks the University's policy of favoring increasingly intimate relationships with the teachers of the state. The modern demands for a multiplication of courses of University grade which shall deal scientifically as well as practically with various types of educational problems, together with the increasingly complex subject of education itself, made necessary this new form of organization, and created the demand for the larger instructional staff which it now embraces. In addition to the former members of the Department of Education, the enlarged faculty now consists of the Dean, who is also professor of educational psychology, another whose work will be mainly in the administrative and supervisory problems of the whole course of study, and members of the faculty who offer teachers' courses in the different secondary school subjects. The High School Visitor, who is also professor of education, offers a course concerned with the secondary school and its problems.

The fundamental purpose and the specific aim of the School of Education is to organize education in the University of Kansas on a strictly university and scientific basis by equipping its students who have chosen teaching as a career with a knowledge of the principles of educational psychology, the historical evolution of educational thought and practice, and school organization, administration and method, so that they may contribute constructively toward the elevation of the teaching profession throughout the public-school system.

Another important part of the work of the School of Education will be investigation and research in the different fields of education, and for this purpose the school desires the assistance and cooperation

of all other educational agencies in the state. In return the University desires to be of service to the state and offers the services of its experts in education, and also offers their results, to such as need advice or information as to the solutions of local educational problems.

The courses are planned to meet the professional needs of the following classes: College and normal-school instructors in education, superintendents and principals of schools, heads of departments in normal and high schools, supervisors of special subjects, and teachers in high schools. Certain of the courses, in which education is presented primarily as an important function of society as well as of individuals, should also be of interest to all University students, whether they intend to become teachers or not.

#### GRADUATE WORK IN SCHOOL OF EDUCATION.

The progressive tendency in many states is to encourage teachers and school administrators to continue in some university advanced research in education. The most vital discoveries in this field must finally be made and checked up by those on the ground—teachers in active service. This work creates a demand for those who have had training in the methods of investigation and in the interpretation of the data collected. The School of Education provides instruction suited to the needs of such graduates of the colleges of the state in educational psychology, history and philosophy of education, educational administration, experimental education and in the principles of teaching the various academic and technical subjects.

A close connection hence exists between the School of Education and the Graduate School of the University of Kansas. A large proportion of those who enter the Graduate School expect to become teachers in colleges, normal schools, and in the best public school systems. Indeed, the master's degree seems again about to become a teachers' degree, as it was historically. The degree of Ph. D., when taken with education as a major, should of course imply not only high grade of scholarship but also a high grade of professional skill and temperamental fitness. The master's degree usually requires one year of graduate work; the doctor's degree three years. Work leading to these higher degrees with education as a major will be planned so as to afford preparation for the responsible positions, particularly those involving administrative and supervisory duties. Graduate work, undertaken with the major in some academic subject and the minor in education, is usually planned in such a way as to afford desirable equipment for the teaching of special branches. One should consult the complete annual catalogue for full information with regard to the Teaching fellowships and University fellowships for graduates of Kansas colleges. All details of registration and of major and minor elections in graduate work may be obtained from the Dean of the Graduate School.

#### UNDERGRADUATE WORK.

The chief work at present in the School of Education is the assuming of all the functions of the former Department of Education and building upon the Junior and Senior years of the College of Arts the

specific training requisite for certificate holders and for candidates for the degree of bachelor of science in education. The School of Education requires, aside from the specific number of hours and prerequisites and grouped electives, a high grade of scholarly work in these undergraduate courses. For the details of the policy for graduation from the school and for receiving its degree and certificate to teach, one should consult the announcements of the School of Education.

#### SPECIAL WORK.

Mature persons who for various reasons find themselves unable to meet the exact academic requirements for the bachelor's degree in education and the regular diploma and certificate, but who show the ability to carry on the work prescribed for certain major subjects in the School of Education, may be admitted as candidates for a special diploma in teaching or the supervision of instruction in elementary schools, or in such subjects as music, free-hand drawing, manual training, hygiene, nature study, physical education, etc. Such special courses will be arranged for them as experience may show desirable. This special diploma has no legal significance.

#### THE COURSE IN EDUCATION.

The courses are so arranged as to enable students to plan for their advanced work from their Junior year with reference to three fairly distinct aspects of education—the historical, the scientific and theoretical, and the administrative. Advanced credit from other universities and colleges or from normal schools will be granted as consideration of the individual cases may warrant. The historical courses embrace general courses in the history of ancient and medieval education, and in the history of modern education. Specific intensive courses are offered dealing with Greek and Roman systems of education and with the more modern theoretical systems of Rousseau and Spencer. There is also a course in the history of education in America. In addition to these courses many other educational topics in courses where the emphasis is not purely historical are discussed in the light of their historical developments.

The scientific and theoretical courses are the following: Elementary psychology of the fundamental processes in education; genetic psychology for teachers; advanced educational psychology, applied to distinctive educational processes, such as habit, reading, learning, etc., and graduate seminars in mental processes which lend themselves to extended investigation. In addition to these there are courses in retardation, the treatment of Backward Children, principles of education, and in the elementary and advanced philosophy of education.

The administrative and practical courses embrace the following topics: Elementary education, the course of study in the elementary schools; elementary school organization and supervision; the secondary school, its development, equipment, curriculum, and administration; school economy; school law and administration; school supervision; principles of method; comparative study of educational systems; high school course of study, and physical education. The special

methods courses taught, in the main by the heads of departments in the University, are as follows: Teachers' courses in German, English, Latin, French, Mathematics, History, Chemistry, Botany, Entomology, Physics, Physical Education and Home Economics.

For further information concerning the School of Education, address, DEAN OF THE SCHOOL OF EDUCATION, UNIVERSITY OF KANSAS.

Announcements of School of Education, containing descriptions of courses, requirements for certificates and degrees, and the general policy of the school, will be forwarded on request.

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### Summer Session.

The Summer Session of the University serves more than one purpose; but it never would have been organized except for the purpose of assisting the high-school teachers of the state and of getting into closer relations with them. This is its chief function; most of its courses are selected and modified to further this aim.

It is too early as yet to announce definite courses for next summer. They will be announced in the Summer Session catalogue, which may be expected in February. They will be somewhat more numerous and more varied than ever before; and, if we can make them so, they will be more helpful to the teacher. It is safe to say that every high-school teacher of every subject will find helpful courses in the next Summer Session.

The University does not offer, in either its summer or its regular sessions, such elementary subjects as arithmetic or geography, or even high-school English, algebra, or geometry. Therefore, teachers in country and graded schools will find no opportunity to review the subjects they teach. Those who really need such reviews must be advised to go elsewhere. But the many who are prepared to profit by the work of the University are advised not to spend the summer in going over yet again the same work they have done during the year, but rather to broaden their intellectual outlook and gain fresh inspiration from more advanced work. At the same time they may be getting a standing in the University and making some progress toward one of its degrees.

High-school teachers, however, of whatever subject, no matter what the extent of their preparation for teaching, may be sure of finding profitable work. Unless they are unusually fortunate in their hours of work and in the variety of subjects they are expected to teach, they are unable to keep pace with the progress of knowledge and the improvement of methods in their fields. In the Summer Session they will find courses taught by men whose chief business it is to do just this thing. Most teachers regret the lack of acquaintance with some subjects allied to the ones they are teaching. In the Summer Session they find an opportunity of making good this deficiency. Many teachers feel the need of courses in the general theory of teaching. Under the direction of the Dean of the School of Education they will find a larger variety of such courses than ever before.

All the courses of the Summer Session will give credit toward some

degree. Most of them are accepted toward the bachelor's degree, but a large number are accepted for graduate credit. Last summer more than a fourth of the students already had the bachelor's degree; of these more than sixty were working toward the master's or the doctor's degree. As the best schools are tending more and more to select their teachers from the holders of advanced degrees, the University is rapidly increasing the opportunities for graduate work. On the other hand, a few such subjects as elementary German, botany, and chemistry are accepted for entrance credit and may be taken for this purpose by those who have not completed their preparation for the University.

But the University does not consider that the giving and receiving of instruction is the sole purpose of the Summer Session. The educational interests of the state will prosper in proportion as all its educational forces work together harmoniously and as parts of a well organized whole. The Summer Session has already done much to secure the personal acquaintance and the consequent better mutual understanding of the University instructors and the high-school teachers. The University confidently expects it to do still more in the future toward promoting the desired harmony and cooperation.

For special information regarding summer work, address DIRECTOR SUMMER SESSION, UNIVERSITY OF KANSAS.

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### Correspondence Instruction.

Within the new University Extension Division, whose province it is to bring university instruction and training to those who are unable to come to Lawrence, there has been organized a Department of Correspondence-Study. The business of this Department is to take the various courses of instruction as given regularly to the students in residence at the University and so organize them that they may be sent forth as written assignments and taught by mail.

The method is simple. Lesson assignments are prepared by the regular members of the faculty and sent out in typewritten form. Each assignment contains an outline of work, references to texts, topics for study, and a series of questions to be answered in writing and sent in. This written lesson is corrected by the instructor and sent back to the student with a new assignment. The student's difficulties are cleared, puzzling questions are explained, and, so far as the inherent difficulties of the method permit, the stimulus and enthusiasm of the classroom are supplied.

The various courses thus offered command University credit when completed acceptably with a satisfactory examination. About eighty-five such correspondence courses are now available.

To the teacher especially, the new Department furnishes a great opportunity. Without leaving home, without relinquishing a paying position, a teacher may thus coin her spare time into terms of efficiency, power and professional progress. One-half of the work required for the A. B. degree or for the Master's degree may thus be done through correspondence. The expense is very light.

Among the correspondence courses now offered which should prove particularly attractive to teachers, are the following:

1. Principles of education.
2. Educational psychology.
3. Advanced philosophy of education.
4. History of modern education.
5. Elementary education.
6. Elementary psychology.

For further information, or a full list of the courses now offered, address the

UNIVERSITY EXTENSION DIVISION,  
THE UNIVERSITY OF KANSAS,  
LAWRENCE, KANSAS.

### **College Entrance Requirements.**

The conditions upon which students graduating from accredited high schools may enter the University have not been changed. As far as we are able to discern the present standards and requirements meet with the general approval of high-school principals and teachers.

Our attention has been called during the past year, to certain articles in some of our educational magazines, which in a general and very indefinite way charged colleges and universities of being united in concerted effort to dominate the high-school situation. At the University of Kansas we recognize no such conspiracy. We have labored consistently to understand the needs, the problems and the historic development of secondary education in this state. We have endeavored to keep foremost in our thoughts the progressive spirit of the high schools in order the more intelligently to serve our part as a University in this rapid educational movement.

## DISTRIBUTION OF ENTRANCE SUBJECTS BY GROUPS.

The subjects from which entrance work may be offered, together with the number of units, are arranged in seven groups, as follows. A total of fifteen units must be offered:

TABLE I.

GROUP I, English.	English, four units.	Three units are required.
GROUP II, Mathematics.	Elementary algebra, one and one-half units. Plane geometry, one unit. Solid geometry, one-half unit. Plane trigonometry, one-half unit. Advanced algebra, one-half unit.	The elementary algebra and plane geometry are required.
GROUP III, Foreign Languages.	Latin, four units. Greek, three units. German, three units. French, three units.	Of these, three units are required, which must be first in Latin, or second, in German.
GROUP IV, Physical Sciences.	Physiography, one or one-half unit. Physics, one unit. Chemistry, one unit.	One unit is required.
GROUP V, Sciences. Biological	Botany, one unit. Zoology, one unit. Physiology, one unit.	One unit is required.

GROUP VI, History.	Greek and Roman, one unit. Medieval and modern, one unit. English, one unit American, one unit. Economics, one or one-half unit. Civics, one-half unit.	One unit is required.
GROUP VII, Vocational Subjects.	Psychology, one-half unit. Methods, one-half unit. Woodwork, one unit. Drawing, one unit. Domestic art, one-half Domestic science, one-half unit. Agriculture, one-half unit. Commercial law, one-half unit. Commercial geography, one-half unit. Bookkeeping, one-half unit.	Only one unit may be offered.

As observed above, to secure unconditional admission to the Freshmen class of the College, the candidate must offer fifteen units from the foregoing list of accredited preparatory subjects. Of these fifteen units, eleven and one-half are prescribed by group; the remaining three and one-half units may be chosen without restriction, except only one unit may be chosen from group VII.

In view of the difficulty some preparatory schools may have in expanding their courses of study so as to include all the required units, until further notice, candidates will be admitted unconditionally who offer fifteen units from the foregoing list, only eight and one-half units of which number are specifically required. No candidate, however, will be permitted to offer more than one unit from group VII. These required subjects are, three units of foreign language, two and one-half units of mathematics, and three years of English.

Students who take advantage of this privilege of postponing prescribed entrance requirements must make good such deferred requirements during their first year in the College. A course so taken during the Freshman year not only satisfies the entrance requirements, but also counts as regular College work.

It is hoped that within a reasonable time all Kansas high schools will be able so to arrange their courses of study as to meet all the requirements of the University.

## THE COURSE OF STUDY.

The suggestive course of study which follows contains all of the subjects usually offered in a high school, whether accepted for College entrance or whether intended for the student who elects only such work as will best fit him for the immediate necessities of active life. It will be noticed that English and mathematics are specifically required in the first three years. Other subjects sufficient in number to complete the course should be selected from the various groups by the principal or superintendent. In preparing a program of studies for any school, the principal should take into consideration, first, the qualifications of the teaching force; second, the equipment of the school; third, the condition and ideals which have prevailed in the school in previous years; fourth, College-entrance requirements. Care should also be taken not to increase the number of optional subjects so as to overwork the teachers, or so that any instructor will be required to teach a branch for which he is not thoroughly prepared. Keeping these suggestions in mind, it will not be difficult for any principal to make out a course of study which will not only meet the conditions in the school, but also the requirements for College entrance, or entrance to any of the special schools in the state.

No subject should be given a place on the program unless it can be handled in the proper way. Bookkeeping is a practical subject and affords an excellent discipline if presented in proper form, but this would require a suitable room with special desks and other facilities, all of which are very expensive; yet, if not provided, this subject is waste of time. Manual training, agriculture, drawing, etc., all of which require special facilities and specially-trained teachers, should be added only when the school is in a financial condition to carry them on properly.

The following tabulation of subjects is offered with the hope that it may be of some assistance to superintendents and principals in arranging a workable high-school course of study. It illustrates the time which should be given to each subject, the year in which it should be offered, and the subjects under the heading "required" which should be fixed in every course of study regardless of its aim or the conditions in the high school. English and mathematics should occupy the most important places in any high-school course of study. This outline also shows all the optional subjects classified by years. It is understood that these optional subjects should be taken at the time indicated in this program unless there is some good reason for making a change.

If all of the accredited high schools can observe the same order and sequence of subjects, the organization of classes will be materially simplified and the standard of work done will be more uniform. For instance, while there are good reasons why civics should be given in the first year of the high school, it is always conceded that this subject, if properly taught, is not suited to the capacity of students who are just entering the high school. There is a wide difference of opinion among teachers with reference to the arrangement of high-school subjects in the course of study, and the following form is given after examination of several hundred courses of study and after consulting with many teachers and superintendents. It must be understood, however, that

this course is merely suggestive, and is offered here principally for the benefit of inexperienced principals or for the study and comparison of those who are more experienced.

## TABLE II.

(Suggestive.)

## FIRST YEAR.

*First Semester.*

Required :

English.

Algebra

Electives (choose two) :

Latin.

Physiography.

Greek and Roman history.

Woodwork or domestic science.

Drawing.

*Second Semester.*

Required :

English.

Algebra

Electives (choose two) :

Latin.

Physiography.

Greek and Roman history.

Woodwork or domestic science.

Drawing.

## SECOND YEAR.

*First Semester.*

Required :

English.

Geometry.

Electives (choose two) :

Latin.

German.

Botany.

Medieval and modern history.

Physiology.

Woodwork or domestic science.

Commercial geography.

*Second Semester.*

Required :

English.

Geometry.

Electives (choose two) :

Latin.

German.

Botany.

Medieval and modern history.

Physiology.

Woodwork or domestic science.

Commercial law.

## THIRD YEAR.

*First Semester.*

Required :

English.

Algebra

Electives (choose two) :

Latin.

German,

Chemistry.

Zoology.

English history.

French.

Agriculture.

*Second Semester.*

Required :

English.

Geometry.

Electives (choose two) :

Latin.

German,

Chemistry.

Zoology.

English history.

French.

Agriculture.

## FOURTH YEAR.

*First Semester.*

Electives (choose four) :

English.

*Second Semester.*

Electives (choose four) :

English.

Physics.  
 Latin.  
 German.  
 American history.  
 Trigonometry.  
 Bookkeeping.  
 Economics or civics.  
 French.  
 Psychology.  
 Review common branches.

Physics.  
 Latin.  
 German.  
 American history.  
 Advanced algebra.  
 Bookkeeping.  
 Economics or civics.  
 French.  
 Methods and management.  
 Review common branches.

## SUGGESTIVE COLLEGE PREPARATORY COURSE FOR HIGH SCHOOLS HAVING ONLY THREE TEACHERS.

The course of study which follows is intended for schools that employ only three teachers. It will be noticed that as the pupils pass into the second and third years of the high school their opportunity for optional work increases. As a rule it is not possible for the small high school of only three teachers to carry more than two lines of work. One of these should be a college preparatory course, while the other should be a general course the character of which should be determined largely upon the preferences of those who are carrying the work. These optionals might be selected with a view to preparation for business or preparation for teaching, depending of course upon the occupations which the pupils propose to follow after graduation from the high school.

The point to be guarded in the small high school is the multiplication of classes, which would require a teacher to undertake a wider range of subjects than her time or preparation would warrant. For this reason the collegiate and special courses should be arranged as nearly alike as possible. It is recommended in the following outline that the first two years of the work should be the same for all courses and that specialization should begin with the third year. In this year one optional may be selected, while in the fourth year each student may have an opportunity to select two optionals. Therefore, any graduate will have an opportunity to offer three units of work from any of the technical courses which will enable him to complete the normal course or do considerable work in preparation for business pursuits, including agriculture and the manual arts. The following outline will illustrate the points indicated above:

### TABLE III.

#### FIRST YEAR.

*First Term.*  
 English.  
 Algebra.  
 Latin or German.  
 History (Greek).

*Second Term.*  
 English.  
 Algebra.  
 Latin or German.  
 History (Roman).

#### SECOND YEAR.

*First Term.*  
 English.  
 Algebra or Geometry.

*Second Term.*  
 English.  
 Geometry.

Latin or German.  
Botany.

Latin or German.  
Botany.

## THIRD YEAR.

*First Term.*

English.  
Geometry or Algebra.  
Latin or German.  
(Select one subject from  
Junior optionals.)

*Second Term.*

English.  
Geometry.  
Latin or German,  
(Select one subject from  
Junior optionals.)

## FOURTH YEAR.

*First Term.*

Physics.  
American history.  
(Select two subjects from  
Senior optionals.)

*Second Term.*

Physics.  
American history.  
(Select two subjects from  
Senior optionals.)

## COURSES OF STUDY FOR HIGH SCHOOLS HAVING TWO TEACHERS.

The following outline represents a high-school course of study where the work is arranged for only two teachers. Such a school cannot be accredited after September 1 unless each student is enabled to complete at least thirteen units of prescribed work before graduation. In order to leave the selection of subjects to the teachers and students as far as possible, an opportunity is given to elect one subject in the second year, one in the third year and three in the fourth year, making five subjects in all.

Since the University has extended its list of prescribed subjects there will be no trouble in making this course conform to the conditions in the district. Care must be taken, however, to reduce the number of classes for each teacher to the minimum, which should not be in any case more than seven recitations per day. This can only be done by the alternation of classes. Such an arrangement for the alternation of classes may be worked out with little difficulty, so that the two teachers may not be required to have more than six recitations per day, or twelve recitations for the two teachers.

It is further recommended here that the alternation of subjects should be confined as far as possible to the third and fourth years, where the classes are smaller and where the students are more mature and work more independently. The optionals suggested here may be selected from the general outline.

TABLE IV.

## FIRST YEAR.

*First Term.*

English.  
Latin or German.  
Algebra.  
Greek or Roman history.

*Second Term.*

English.  
Latin or German.  
Algebra.  
Greek or Roman history.

## SECOND YEAR.

English.  
Geometry or Algebra.

English.  
Geometry.

Latin or German.  
(Select one from second year  
optionals.)

Latin or German.  
(Select one from second year  
optionals.)

### THIRD YEAR.

#### *First Term.*

English.  
Algebra or Geometry.  
Latin or German.  
(Select one from third-year  
optionals.)

#### *Second Term.*

English.  
Select one-half unit.  
Latin or German.  
(Select one from third-year  
optionals.)

### FOURTH YEAR.

#### *First Term.*

Physics.  
(Select three from fourth-  
year optionals.)

#### *Second Term.*

Physics.  
(Select three from fourth-  
year optionals.)

## North Central Association.

### PURPOSE.

The aim of the North Central Association of Colleges and Secondary Schools is, first, to bring about a better acquaintance, a keener sympathy and a heartier cooperation between the colleges and secondary schools of this territory; secondly, to consider common educational problems and to devise best ways and means of solving them; and thirdly, to promote the physical, intellectual and moral well-being of students by urging proper sanitary conditions of school buildings, adequate library and laboratory facilities, and higher standards of scholarship and of remuneration of teachers. The Association is voluntary, organized and devoted solely to the highest welfare of the boys and girls of this territory, and it bespeaks the cordial and sympathetic support of all school men.

### STANDARDS OF ADMISSION.

The following constitute the standards of admission to this Association for the present year:

1. No school shall be accredited which does not require fifteen units, as defined by the Association, for graduation. More than twenty periods per week should be discouraged.

2. The minimum scholastic attainment of all high-school teachers shall be equivalent to graduation from a college belonging to the North Central Association of Colleges and Secondary Schools, including special training in the subjects they teach, although such requirements shall not be construed as retroactive.

3. The number of daily periods of classroom instruction given by any one teacher should not exceed five, each to extend over at least forty minutes in the clear. The Association advises five periods. The Board of Inspectors will reject all schools having more than six recitation periods per day for any teacher.

4. The laboratory and library facilities shall be adequate to the needs of instruction in the subjects taught as outlined by the Association.

5. The location and construction of the buildings, the lighting, heating and ventilation of the rooms, the nature of the lavatories, corridors, closets, water supply, school furniture, apparatus and methods of cleaning shall be such as to insure hygienic conditions for both pupils and teachers.

6. The efficiency of instruction, the acquired habits of thought and study, the general intellectual and moral tone of a school are paramount factors, and therefore only schools which rank well in these particulars, as evidenced by rigid, thoroughgoing, sympathetic inspection, shall be considered eligible for the list.

7. Wherever there is reasonable doubt concerning the efficiency of a school, the Association will accept that doubt as ground sufficient to justify rejection.

8. The Association will decline to consider any school whose teaching force consists of fewer than four teachers of academic subjects exclusive of the superintendent.

9. No school shall be considered unless the regular annual blank furnished for the purpose shall have been filled out and placed on file with the inspector. In case of schools having twelve or more teachers a complete report on teachers once in three years will be sufficient; but full data relative to changes should be presented annually.

10. All schools whose records show an abnormal number of pupils per teacher, as based on average number belonging, even though they may technically meet all other requirements, are rejected. The Association recognizes thirty as maximum.

11. The time for which schools are accredited shall be limited to one year, dating from the time of the adoption of the list by the Association.

12. The organ of communication between the accredited schools and the secretary of the commission for the purpose of distributing, collecting, and filing the annual reports of such schools and for such other purposes as the Association may direct, is as follows:

(a). In states having such an official, the inspector of schools appointed by the state university. (b). In other states the inspector of schools appointed by state authority, or, if there be no such official, such person or persons as the secretary of the commission may select.

The Association is very conservative, believing that such action will eventually work to the highest interests of the schools and the Association. It aims to accredit only those schools which possess organization, teaching force, standards of scholarship, equipment, *esprit de corps*, etc., of such character as will unhesitatingly commend them to any educator, college or university in the North Central territory.

#### KANSAS HIGH SCHOOLS ACCREDITED BY THE NORTH CENTRAL ASSOCIATION OF COLLEGES AND SECONDARY SCHOOLS.

At the present time twenty-two high schools have fully reached the North Central standard, and are enrolled as members of that Association.

tion. Others, no doubt, are worthy, and it is hoped that Kansas will gradually enlarge its representation upon this larger list of accredited schools.

Lawrence  
 Leavenworth  
 Ottawa  
 Paola  
 Parsons  
 Pratt  
 Salina  
 Sumner Co. (Wellington)  
 Topeka  
 Wichita  
 Winfield

Abilene  
 Arkansas City  
 Concordia  
 Emporia  
 Fort Scott  
 Hiawatha  
 Holton  
 Hutchinson  
 Iola  
 Junction City  
 Kansas City

## English Index.

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4. The laboratory and library facilities shall be adequate to the needs of instruction in the subjects taught as outlined by the Association.

5. The location and construction of the buildings, the lighting, heating and ventilation of the rooms, the nature of the lavatories, corridors, closets, water supply, school furniture, apparatus and methods of cleaning shall be such as to insure hygienic conditions for both pupils and teachers.

6. The efficiency of instruction, the acquired habits of thought and study, the general intellectual and moral tone of a school are paramount factors, and therefore only schools which rank well in these particulars, as evidenced by rigid, thoroughgoing, sympathetic inspection, shall be considered eligible for the list.

7. Wherever there is reasonable doubt concerning the efficiency of a school, the Association will accept that doubt as ground sufficient to justify rejection.

8. The Association will decline to consider any school whose teaching force consists of fewer than four teachers of academic subjects exclusive of the superintendent.

9. No school shall be considered unless the regular annual blank furnished for the purpose shall have been filled out and placed on file with the inspector. In case of schools having twelve or more teachers a complete report on teachers once in three years will be sufficient; but full data relative to changes should be presented annually.

10. All schools whose records show an abnormal number of pupils per teacher, as based on average number belonging, even though they may technically meet all other requirements, are rejected. The Association recognizes thirty as maximum.

11. The time for which schools are accredited shall be limited to one year, dating from the time of the adoption of the list by the Association.

12. The organ of communication between the accredited schools and the secretary of the commission for the purpose of distributing, collecting, and filing the annual reports of such schools and for such other purposes as the Association may direct, is as follows:

(a). In states having such an official, the inspector of schools appointed by the state university. (b). In other states the inspector of schools appointed by state authority, or, if there be no such official, such person or persons as the secretary of the commission may select.

The Association is very conservative, believing that such action will eventually work to the highest interests of the schools and the Association. It aims to accredit only those schools which possess organization, teaching force, standards of scholarship, equipment, *esprit de corps*, etc., of such character as will unhesitatingly commend them to any educator, college or university in the North Central territory.

#### KANSAS HIGH SCHOOLS ACCREDITED BY THE NORTH CENTRAL ASSOCIATION OF COLLEGES AND SECONDARY SCHOOLS.

At the present time twenty-two high schools have fully reached the North Central standard, and are enrolled as members of that Associa-

tion. Others, no doubt, are worthy, and it is hoped that Kansas will gradually enlarge its representation upon this larger list of accredited schools.

Lawrence  
Leavenworth  
Ottawa  
Paola  
Parsons  
Pratt  
Salina  
Sumner Co. (Wellington)  
Topeka  
Wichita  
Winfield

Abilene  
Arkansas City  
Concordia  
Emporia  
Fort Scott  
Hiawatha  
Holton  
Hutchinson  
Iola  
Junction City  
Kansas City

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